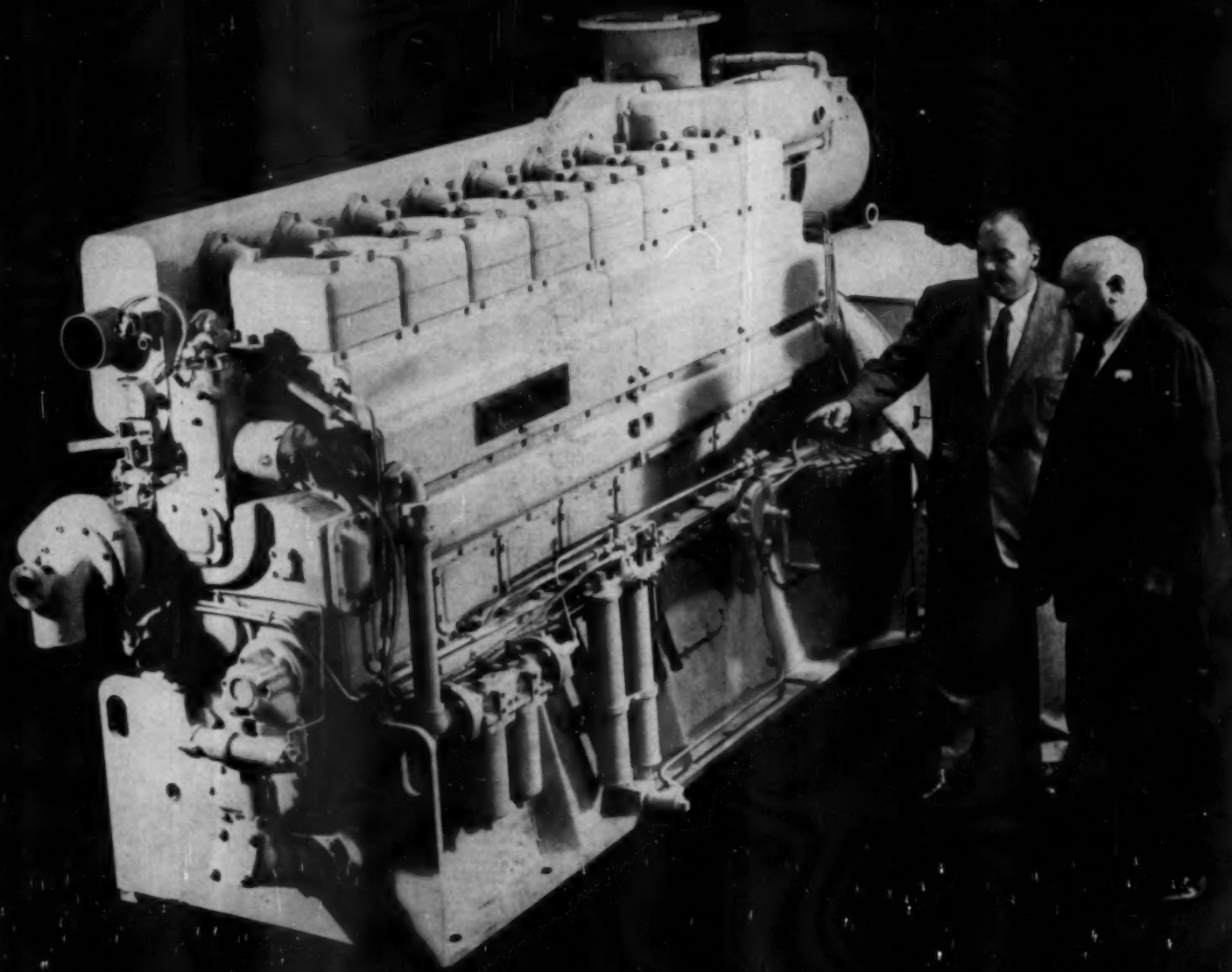


IN INDUSTRY • IN TRANSPORTATION • ON THE SEA • IN THE AIR



FIVE DOLLARS PER YEAR

FEBRUARY, 1953

FIFTY CENTS PER COPY

How San Antonio's Mission Pumping Station assures

FREE

PUMPS at Mission Pumping Station, San Antonio, Texas, are driven by three Fairbanks-Morse dual-fuel engines. The problem of maintaining the dependable, economical performance these engines were designed to deliver is solved by lubrication with *Texaco Ursa Oil*. Says Assistant Manager R. A. Thompson, Jr. —

"During the two years these engines have been in service, *Texaco Ursa Oil* has kept them exceptionally clean — no sludge in crankcase, no carbon formations, and rings free in their grooves. Wear is negligible. We give *Texaco Ursa Oil* the lion's share of the credit for our low maintenance costs and low fuel consumption."

Whether you're operating Diesel, gas or dual-fuel engines, you can get a *Texaco Ursa Oil* to assure fine performance. There is a complete line of *Texaco Ursa Oils*, approved by leading engine builders and preferred by operators everywhere. In fact —

*For over 15 years, more stationary Diesel h.p. in the U. S.
has been lubricated with Texaco than with any other brand.*

The first step toward better engine performance is to call in a Texaco Lubrication Engineer. Just contact the nearest of the more than 2,000 Texaco Distributing Plants in the 48 States, or write The Texas Company, 135 East 42nd Street, New York 17, N. Y.

TUNE IN . . . TEXACO
STAR THEATER
starring MILTON BERLE,
on television
Tuesday nights
METROPOLITAN OPERA
radio broadcasts
Saturday afternoons.

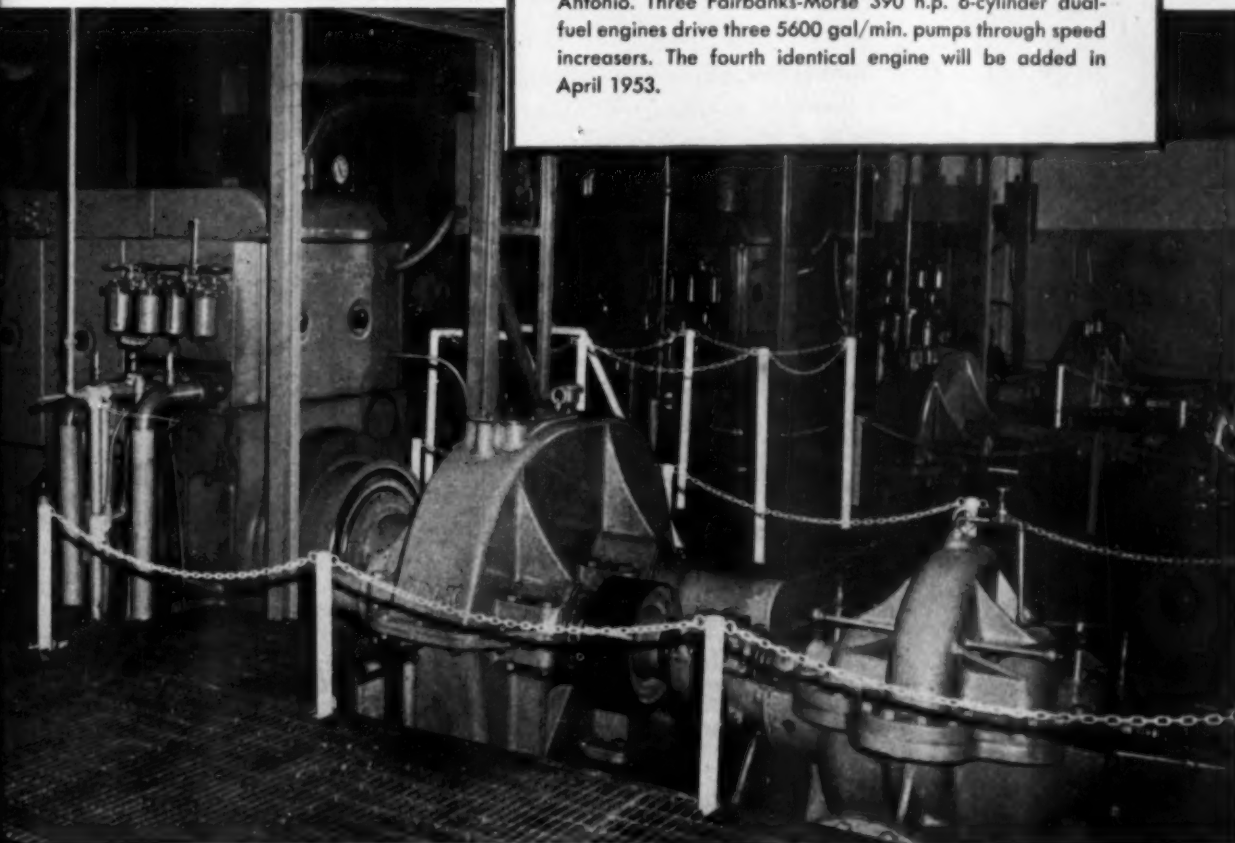


TEXACO



RINGS

MODEL OF EFFICIENCY. Mission Pumping Station supplies water to the south side of the city of San Antonio. Three Fairbanks-Morse 390 h.p. 6-cylinder dual-fuel engines drive three 5600 gal/min. pumps through speed increasers. The fourth identical engine will be added in April 1953.



URSA OILS

**FOR ALL DIESEL, GAS
AND DUAL-FUEL ENGINES**



**'12.00 ALLOWANCE
On Your Old
9" Alco Cylinder Liners**



**When You Purchase New
GUN IRON LINERS**

Now Hunt-Spiller offers you the opportunity to replace 9" Alco liners on a money-saving exchange basis. With each order of a new Gun Iron liner, we will allow a credit of \$12.00 for a used 9" Alco liner, either plated or unplated, and of any make.

This plan permits you to obtain a new cylinder liner free from any cavitation or stress which would ultimately result in fatigue failure—both probable imperfections in a reclaimed liner.

Hunt-Spiller's Gun Iron liners are unplated. Because of its dense, pearlitic structure Gun Iron provides the wear-resistant properties that can only be secured by plating other materials. The wide acceptance of Hunt-Spiller liners by major railroads throughout the country proves their dependability. They are Parco lubrized and service records show quick break-in, reduced oil consumption and long life.

These liners are carried in stock available for immediate shipment.

A new catalog of diesel parts currently being produced by Hunt-Spiller is now available. Your copy will be sent without obligation upon request.



HUNT • SPILLER

MANUFACTURING CORPORATION

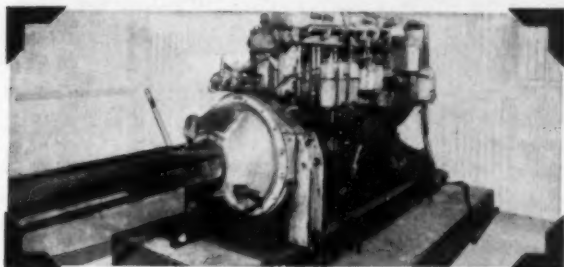
387 DORCHESTER AVENUE • SOUTH BOSTON 27, MASS.

Canadian Representatives: Joseph Robb & Co., Ltd., 4050 Namur St., Montreal 16, P. Q.

THE ENGINEER'S REPORT

DATA
LUBRICANT *RPM DeLo Oils*
UNIT *Caterpillar D13000 diesel*
CONDITIONS *Constant load*
PERIOD *7650 hours*
FIRM *Dean H. Thayer,
Mesa, Ariz.*

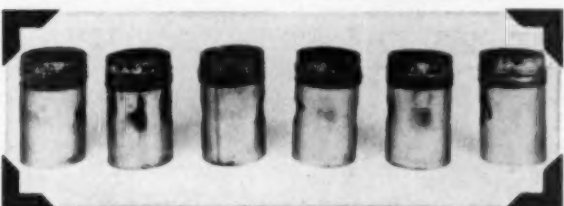
Only 0.001" bearing wear in 7650 hours of work!



WORKING UNDER A CONSTANT LOAD pumping water, this D13000 diesel on the Dean H. Thayer ranch, Mesa, Arizona, ran 7650 hours before it was overhauled. An emergency made it necessary to run the engine for several days without safety cut-offs. Severe over-heating caused the governor to stick and the unattended engine reached a speed of approx. 1800 r.p.m. before it could be shut down.

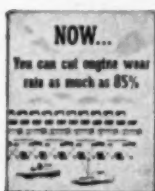


OPERATED ON RPM DELO Supercharged-2 Lubricating Oil during the 7650 hours, con rod bearings showed only 0.001" greatest wear. There was no pitting and all parts were unusually clean.



NO MEASURABLE WEAR was evident on the pistons which showed original tool marks. Greatest wear on liners was 0.005. Piston rings were all free, oil rings were open. After inspection, main bearings, crankshaft, cam & cam bearings, piston pins and bushings were all put back in service.

REMARKS: This engine operates year 'round in widely varying temperatures. In wintertime, the irrigation water is used to prevent the crops from freezing.



There is an RPM DELO Oil to meet every heavy-duty engine operation condition.

FREE BOOKLET on the RPM DELO Oils gives you complete information. Write or ask for it today.



TRADEMARK "RPM DELO" REG. U.S. PAT. OFF.

How RPM DELO Oils keep engines clean and prevent wear



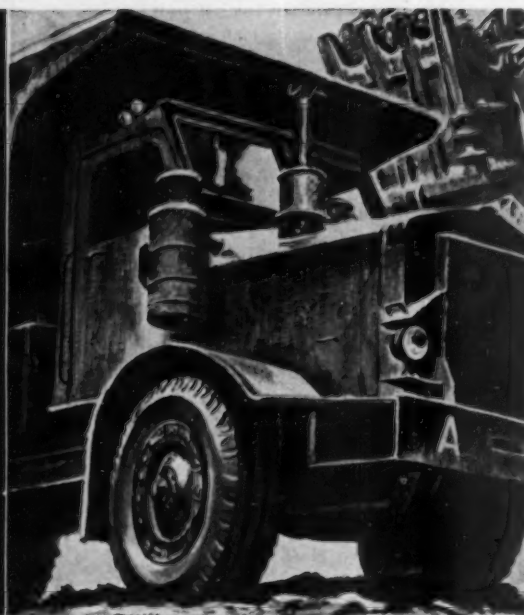
- A. Contain special additives that provide metal-adhesion qualities...keep oil on parts whether they are hot or cold, running or idle.
- B. Anti-oxidant resists deterioration of oil and formation of lacquer...prevents ring-sticking. Detergent keeps parts clean, helps prevent scuffing.
- C. Special compounds stop corrosion of any bearing metal, and oil foaming in both wet and dry sump engines.

FOR MORE INFORMATION about this or other petroleum products of any kind, or the name of your nearest distributor handling them, write or call any of the companies listed below.

STANDARD OIL COMPANY OF CALIFORNIA • San Francisco 20
THE CALIFORNIA OIL COMPANY • Barber, New Jersey

STANDARD OIL COMPANY OF TEXAS • El Paso
THE CALIFORNIA COMPANY • Denver 1, Colorado

You Can Extend Life of ENGINES, TRANSMISSIONS and DIFFERENTIALS



With Allison Torqmatic Drives

BASED on user records, heavy-duty trucks equipped with Allison TORQMATIC CONVERTERS and TRANSMISSIONS last longer and cost less to operate than trucks with mechanical drives.

Records show that Allison TORQMATIC DRIVES boost truck availability, enabling operators to improve their schedules and, thus, they can do more business.

Trucks — and other heavy equipment — with Allison TORQMATIC DRIVES use the flexibility of the converter to start heavy loads and make shock-free gear-shifts at full power. The Allison TORQMATIC DRIVES automatically balance engine power with the load requirement. This automatic operation makes the driver's job easier and reduces wear on the whole unit—thus cutting maintenance cost.

You are interested! Attach this advertisement to your letterhead and send it to Allison. You will receive detailed evidence on what these Allison TORQMATIC DRIVES will do for you.

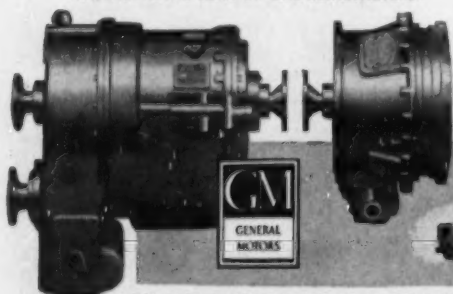
And the next time you're ordering heavy-duty equipment, you'll ask your dealer or manufacturer for units with Allison TORQMATIC DRIVES.

ALLISON Division of GENERAL MOTORS
Box 894DD, Indianapolis 6, Indiana

RATE OF COMPONENT OVERHAULS			
MECHANICAL POWER TRAIN			
ENGINE	CLUTCH	TRANSMISSION	DIFFERENTIAL
48	3.4	3.18	76
CONVERTER POWER TRAIN			
48	46	39	39

Rate of clutch, transmission and differential overhauls per engine overhaul for trucks equipped with mechanical drive and Allison TORQMATIC DRIVES. It shows that trucks with Allison TORQMATIC DRIVES have longer engine life, longer transmission life, and longer differential life.

MATCHED UNITS BUILT BY ONE MANUFACTURER



Allison TORQMATIC DRIVES

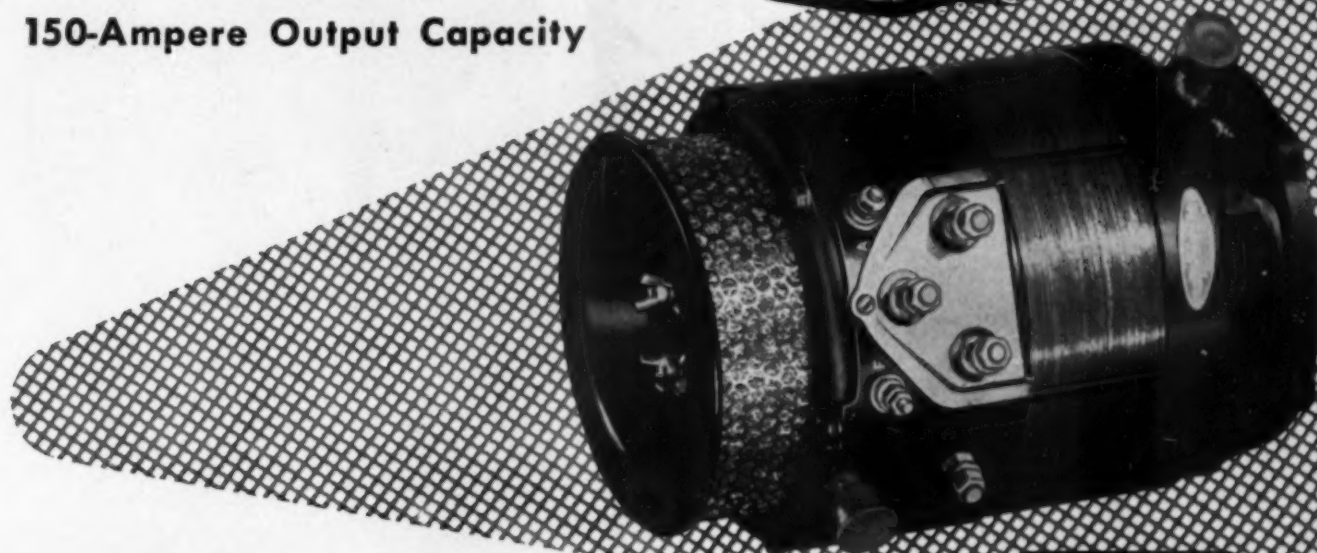


COMPACT, EFFICIENT HYDRAULIC DRIVE FOR TRUCKS * CRANES * TRACTORS * SHOVELS * DRILLING RIGS

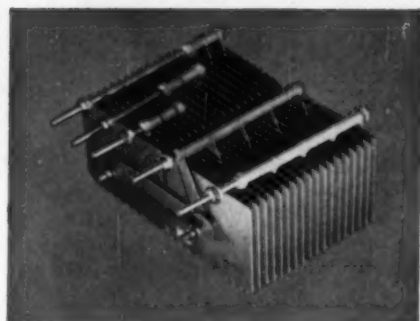
Right for the Job!

New **DELCO-REMY** **A. C. GENERATOR** (ALTERNATOR)

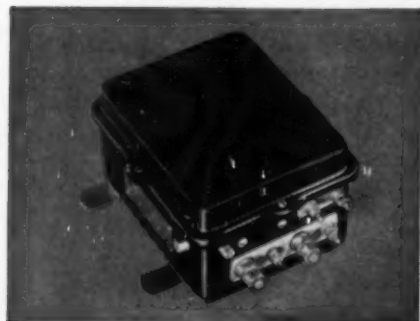
150-Ampere Output Capacity



A. C. GENERATOR



RECTIFIER



REGULATOR

The new Delco-Remy A.C. generator is the heart of a 12-volt A.C.-D.C. electrical system designed specifically for modern Diesel buses with fluorescent lighting and extra-heavy electrical loads.

It cuts in at approximately 550 generator rpm and reaches a maximum output of 150 amperes* at approximately 1175 rpm.

The new generator not only supplies alternating current for fluorescent lighting, but also ample direct current for the heaviest electrical loads coupled with lengthy engine-at-idle periods.

Impressive features of the new generator are its relatively light weight, its very high output capacity and its ability to operate over a wide range of speeds.

Specify Delco-Remy electrical equipment on your new buses.

DELCO-REMY

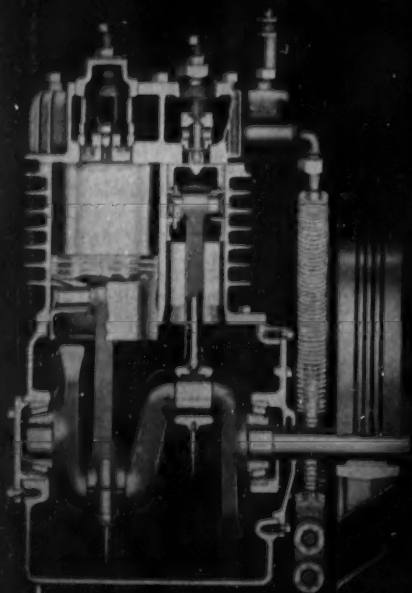
Division, General Motors Corporation, Anderson, Indiana

WHEREVER WHEELS TURN OR PROPELLERS SPIN



**Power
Dead?**

start up anyway!



Simply switch the V-belt from electric motor to gasoline engine. That's how easy it is to provide emergency starting air during power line failures — with the Gardner-Denver ADD Combination Unit in your diesel plant.

◁ Notice the sturdy compressor details revealed in this cross-section drawing. The ADD is built for dependable service — is backed by 94 years of Gardner-Denver manufacturing experience. Write for full details.

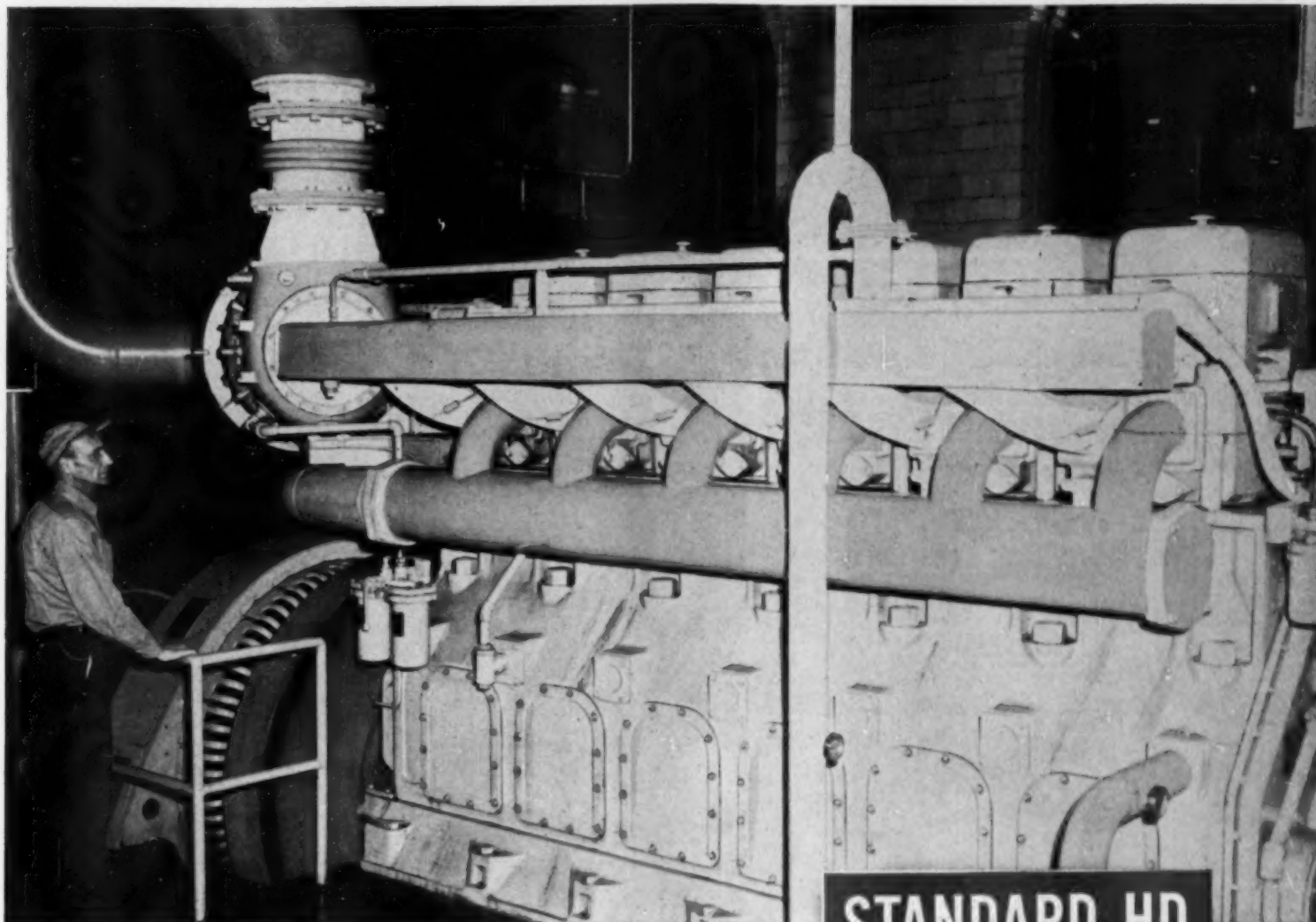
GARDNER-DENVER

SINCE 1859

Gardner-Denver Company, Quincy, Illinois

THE QUALITY LEADER IN COMPRESSORS, PUMPS AND ROCK DRILLS

DIESEL PROGRESS



Gets maximum protection with...

STANDARD HD
TRADE MARK
OIL

● At the time this supercharged diesel engine was installed in a municipal power plant, STANDARD HD Oil had already established an outstanding record for effective lubrication in the plant's other units. In the new unit, STANDARD HD has set a new high for efficient performance.

Most of the plant's load has been carried by the new, supercharged unit. In two years of continuous, hard service, STANDARD HD has supplied clean, protective lubrication. There have been no shut-downs for oil system maintenance. The original fill of oil has never been changed and has remained in excellent condition, as shown by periodic tests of oil samples.

The experience of this power plant, and that of a

host of midwest diesel operators, indicates the savings you can make with STANDARD HD. The Standard Oil lubrication specialist serving your section of the Midwest will be glad to give you information about the use of STANDARD HD in plants near your own with which you may be familiar. You can contact the lubrication specialist by phoning your local Standard Oil office. Or write: Standard Oil Company, 910 South Michigan Avenue, Chicago 80, Illinois.

STANDARD OIL COMPANY



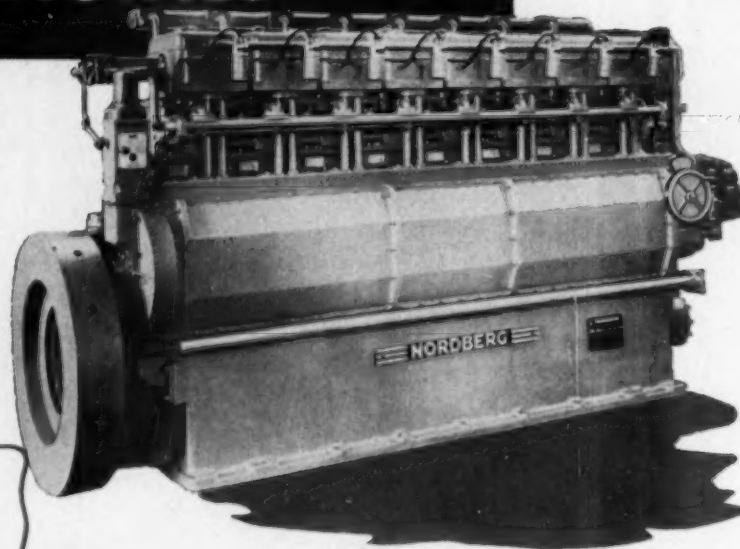
(Indiana)

NOW... SUPAIRTHERMAL*

GAS ENGINES

*Trade mark

**...another NORDBERG
achievement for
outstanding
GAS FUEL ECONOMY
in a WIDE RANGE
of HORSEPOWER**



Ten

IMPORTANT FEATURES

1. High thermal efficiency.
2. Proven ignition systems.
3. Same heavy-duty construction features as Nordberg 4-cycle Diesel engines.
4. Double the horsepower of naturally aspirated engines.
5. Smooth, uniform combustion.
6. Lower exhaust temperatures.
7. Convertible to Diesel or DUAFUEL® operation.
8. More horsepower hours per gallon of lubricating oil.
9. Wide range of horsepower.
10. Wide speed range.

NORDBERG 4-cycle spark-fired gas engines, in sizes from 265 to 4260 H. P., now fill a long desired need for a highly efficient prime mover in industrial and municipal service. Increasing gas fuel costs have made *economy* the "watchword" of power plant operation. Nordberg SUPAIRTHERMAL spark-fired gas engines have a thermal efficiency in excess of 40 per cent as compared to 30 per cent or less in conventional non-supercharged engines.

Substantial savings in fuel costs and lower installation costs result through use of Nordberg gas engines. When capitalized over a period of years, they will more than pay for the original investment.

If you are looking for ways to cut power costs, get the full story on this latest Nordberg achievement... the result of sixty years' experience in the design and construction of prime movers and heavy machinery.

NORDBERG MFG. CO., Milwaukee, Wisconsin

NORDBERG

**DIESEL • DUAFUEL® AND
SPARK-FIRED GAS ENGINES**

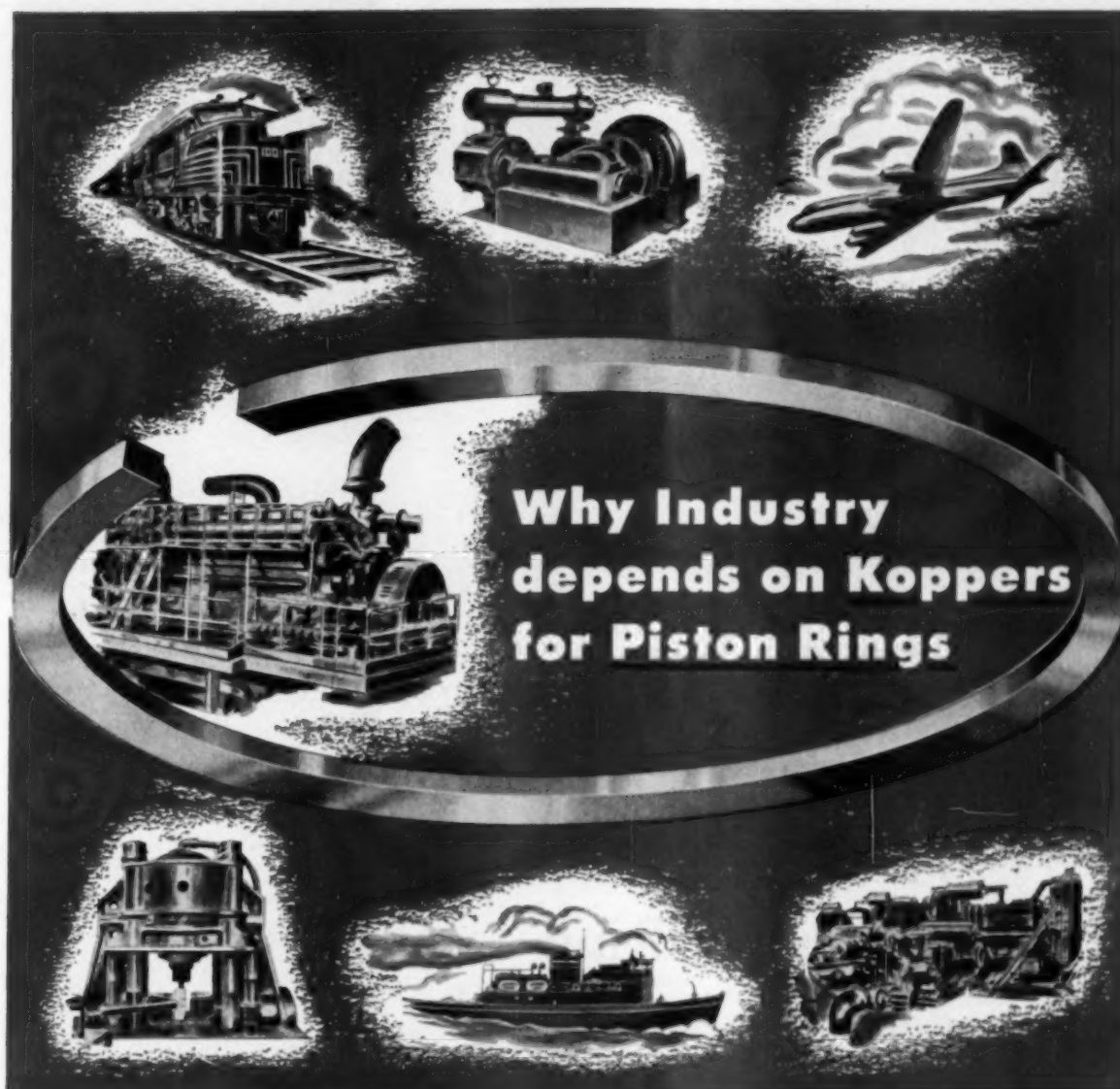


Builders of America's Largest Line of Heavy-Duty Diesels

P253

For complete details about Nordberg Spark-Fired Gas Engines, write for a copy of the new BULLETIN 221.





Koppers manufactures piston rings in every size, of every type, for every industrial and aircraft purpose.

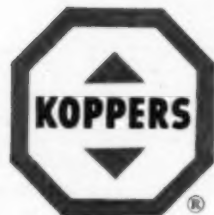
FROM everywhere in industry come reports of savings in time, labor and money through the use of Koppers Rings in diesel and gas engines, hydraulic presses, compressors and other industrial equipment. That's because Koppers research and engineering keep up with modern advances in engine and equipment design by constantly improving piston ring materials and manufacturing methods.

Koppers K-Iron® Rings are made of a high-grade, closely-controlled material that imparts improved wear properties and is surface treated chemically as an anti-scuffing aid. They are made in diameters to 120" in a variety of joint

types. Koppers Porous Chrome® Rings hold and distribute oil during break-in, quickly wear to best possible seating...*cut cylinder wear up to 50%, last 4 times as long as ordinary rings!*

Our engineers, who work with you in determining the best rings for your applications, have all the facilities of the large, modern Koppers piston ring plant at their disposal . . . to supply you with rings that cut down-time, increase efficiency and lengthen the life of your equipment.

WRITE, wire or phone us today for experienced help with your piston ring problems. **KOPPERS COMPANY, INC., Piston Ring Dept., 1582 Hamburg St., Baltimore 3, Md.** *Van der Horst Process



Koppers American Hammered Industrial Piston Rings

Only KOPPERS can furnish K-Spun® and Porous Chrome!

CHROME

gives unequalled resistance to

HEAT, FRICTION, CORROSION, ABRASION

in the new

Sealed Power

Chrome-Faced

Cyclan

Compression Ring

— plus all these famous Cyclan advantages:

- High tensile strength alloy iron machined to Sealed Power's exacting specifications
- Extreme resistance to property changes under operating conditions
- High impact value for shock resistance
- High resistance to breakage plus ability to undergo considerable distortion prior to fracture without sacrificing resilience
- A structure that assures excellent wear qualities



SEALED POWER
CORPORATION
MUSKEGON, MICHIGAN

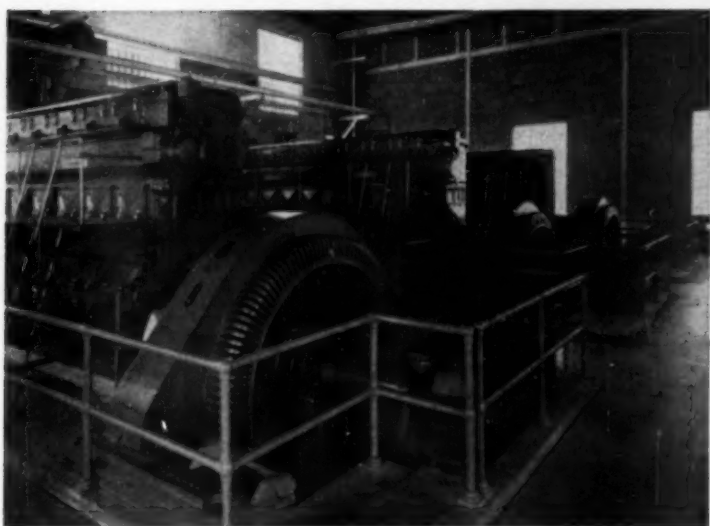
Write for complete information

Sealed Power

**PISTON RINGS · PISTONS
CYLINDER SLEEVES**



...brand new from the ground up



THREE TIRELESS E-M GENERATORS work at the new Bellefontaine plant, direct-connected to powerful diesels. E-M Generator frames are welded, rolled steel. Coils are specially insulated for high dielectric strength. Operating characteristics are perfectly matched to companion E-M Switchgear.

All major electrical equipment is E-M at new Bellefontaine, Ohio power plant

The Bellefontaine engineer in the picture above is operating a masterpiece of modern Switchgear design.

He can see that the E-M Switchboard has a clean, sleek, attractive appearance. And he knows that behind this shiny face is a Switchgear system second to none. These are the reasons E-M has been chosen prime supplier of electrical equipment at Bellefontaine and at so many other new plants:

E-M Switchgear and Generator engineers are *specialists*... they select and blend together pre-engineered components into integrated combinations *matched exactly* to the individual plant's requirements. It takes extra-value engineering to do this well, as standard combinations just don't come close enough to intricate modern plant specifications.

E-M also applies high standards of quality... above ordinary commercial standards... to all components. Circuit breakers, disconnects, switches, meters, panels and accessories... all have an extra margin of durability... a bonus value that will add years to plant operating life.

Your nearest E-M field engineer will be glad to tell you how E-M tackles such a job, and what successes we have had. For general background, write for Publication No. 194 on E-M Switchgear and No. 196 on E-M Generators.

ELECTRIC MACHINERY MFG. COMPANY
MINNEAPOLIS 13, MINNESOTA

This is the E-M Equipment at Bellefontaine:

THREE 1250 kva, 360 rpm, 2400/4160 volt E-M Engine-Type Synchronous Generators... 1000 kw at 0.8 leading power factor.

THREE 15 kw, 1750 rpm, 125 volt shunt-wound Belted Exciters.

TWELVE-PANEL SWITCHGEAR, including: Six generator and exciter panels, with 600 amp. d.c. electrically-operated breakers and heavy duty oil switches with 50,000 kva interrupting capacity.

Five feeder panels with induction-type overload relays. Swing panels with synchroscope, frequency meter and synchronizing lamps. Incoming line panel and panel mounted voltage regulators.

4200-TPA-2119

SPECIALISTS IN SWITCHGEAR AND GENERATOR ENGINEERING



to keep torque converters cool under the
heavy drag and pull of drilling 8000 ft. wells

this Cummins
powered draw works
is safeguarded by...



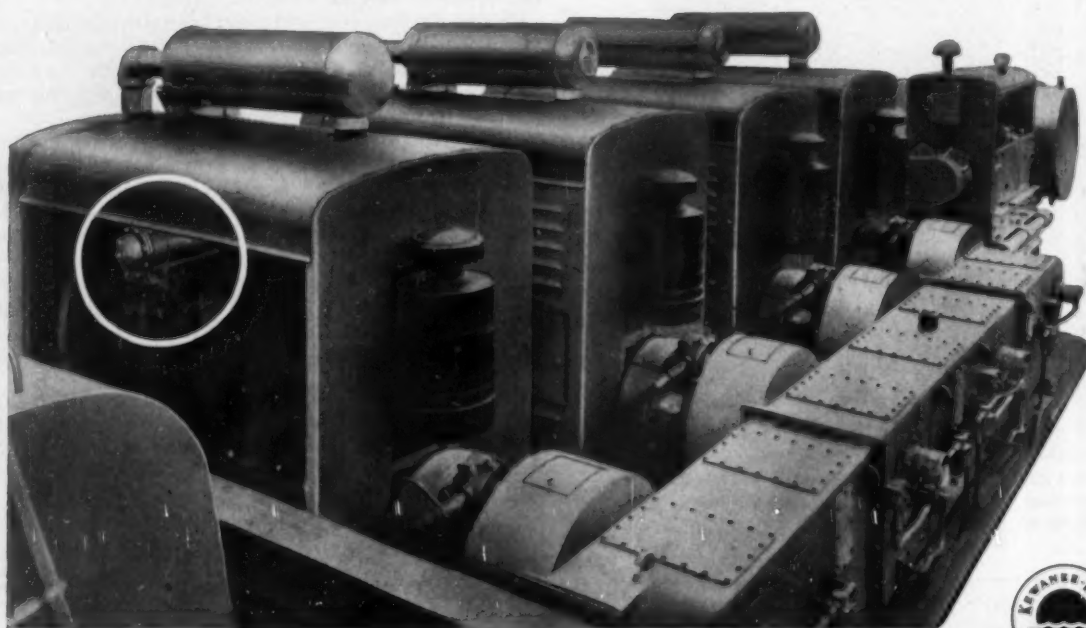
Running 4½" drill pipe to depths of 8000 ft., at economical engine speeds, this draw works is powered by four torque converter equipped Cummins 200 hp Diesels.

To safeguard the torque converters against lost power and damage from over-heating . . . brought on by the heavy drag and pull . . . each engine incorporates a Ross Exchanger. Hydraulic fluid is thereby kept safely within the most effective temperature range.

The wide spread use of dependable Ross Exchangers on "Cummins Dependable Diesels" has been going on for years, serving a variety of functions in a great variety of oil industry applications: As coolers for lube oil, jacket water and/or hydraulic fluid on Cummins powered spudders, floating pumping barges, shovels, bulldozers, cranes, trucks and generator sets. Oil field men have learned to count on both!

For information on the durable copper and copper alloy construction, the pre-engineering and standardization that have made this Ross Exchanger the distinct preference for all types and makes of machinery, for all industries, request Bulletin 1.1K5.

KEWANEE-ROSS CORPORATION
DIVISION OF AMERICAN RADIATOR & STANDARD SANITARY CORPORATION
1425 WEST AVENUE • BUFFALO 13, N. Y.



Serving home and industry

AMERICAN STANDARD • AMERICAN BLOWER • CHURCH SEATS • DETROIT LUBRICATOR • KEWANEE BOILERS • ROSS HEATER • TONAWANDA IRON

ANOTHER GM DIESEL-ELECTRIC TUG FOR ERIE R. R.

The "Hornell," Erie Railroad's newest harbor tugboat. Designed by Tams, Inc. and built at Jakobson's Shipyard, Oyster Bay, L. I., this tug is powered by a General Motors Diesel engine.



The "Hornell" is one of five new tugs recently added to the Erie Railroad fleet. These General Motors Diesel-Electric powered tugs will give the dependable and efficient service which is required in New York harbor service.

CLEVELAND DIESEL ENGINE DIVISION

GENERAL MOTORS • CLEVELAND 11, OHIO



ENGINES FROM 150 TO 2000 H.P.

SALES AND SERVICE OFFICES

Cambridge, Mass. • Jacksonville, Fla. • Miami, Fla. • Montreal, P. Q. • New Orleans, La. • New York, N. Y. • Norfolk, Va. • Orange, Texas
San Francisco, Calif. • Seattle, Wash. • St. Louis, Mo. • Tampa, Fla. • Toronto, Ont. • Vancouver, B. C. • Washington, D. C. • Wilmington, Calif.

AGED BUT ACTIVE. Eight-year old TD-14 and dozer cleans top of 16-foot seam of asphaltic limestone, plays its part in maintaining 200,000-ton annual production.



Keeping off the **ROCKS** at Margerum

Alabama Asphaltic Limestone Company began profitable operations by switching to International Crawlers in 1945

In 1945 the Alabama Asphaltic Limestone Company, due to the high cost of handling materials with steam cranes and clamshells, switched to the use of fast and flexible International crawler tractors, a conversion that helped put production on a profitable basis.

Four International TD-18As and TD-14As now speed materials handling.

S. E. Neill, vice president, reports:

"Production now runs 200,000 tons of finished product annually, and we are supplying road builders all over the Southeast. Our equipment orders specify nothing but International crawlers and IH engines for our compressors."



FLEXIBLE EQUIPMENT. The same TD-14A crawler does crushed asphaltic limestone away from the conveyor belt to a 35,000-ton stockpile. Both cold mix (ready-to-lay material) and pulverized Asphaltic Limestone for hot mix paving material (black top) is used on roads throughout southeastern section of the country.



STOCKPILING SAND. Sand that is unloaded from hopper bottom cars is pushed up on the stockpile and also into the hopper at the mixing plant by a TD-14A and dozer.

If materials handling costs are eating into your income, call your International Industrial Distributor for practical suggestions. International "Power that Pays" will help keep the profit in your pockets.

INTERNATIONAL HARVESTER COMPANY, CHICAGO 1, ILL.

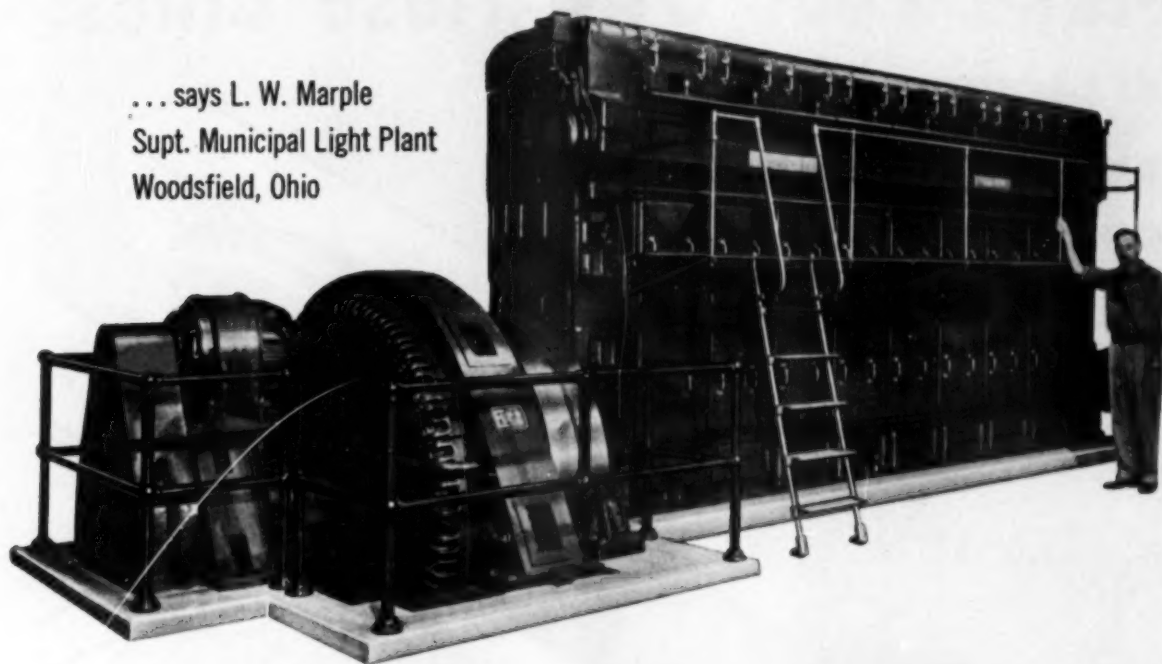
POWER THAT PAYS



INTERNATIONAL

"No More Sticking Rings..."

... says L. W. Marple
Supt. Municipal Light Plant
Woodsfield, Ohio



- "Because of the lubricating oil we were previously using," says Mr. Marple, "sticking rings and carbon build-up were persistent problems on our three Fairbanks-Morse Model 32-E diesels.

"Three years ago, at the recommendation of one of your lubrication engineers, we switched to Sinclair GASCON® Oil D—HD.

"GASCON D—HD has cleared up our troubles... no more sticking or broken rings... no more carbon build-up, even though our load factor has increased. The result is a considerable savings in maintenance costs.

"We are also getting outstanding results with GASCON in our new 875 H.P. National Superior Dual Fuel Engine."

Perhaps a Sinclair Lubrication Engineer can solve *your* lubrication problems. Call your local Sinclair Representative or write to Sinclair Refining Company, 600 Fifth Avenue, New York 20, N. Y.

SINCLAIR DIESEL LUBRICANTS

save wear and replacements

Make Your Own Hose Lines

AEROQUIP HOSE AND FITTINGS

**ARE MATCHED FOR
GUARANTEED PERFORMANCE**



• No skill or special training is required to assemble Aeroquip Flexible Hose Lines by hand in a matter of minutes! **YOU CUT COSTS** because Aeroquip fittings are detachable and may be used again and again. **YOU REDUCE INVENTORY** because with Aeroquip bulk hose and a few fittings you can fill practically all your hose line requirements. **YOU REDUCE DOWNTIME** because with Aeroquip on hand, quick hose line replacements are available at all times.

Cut hose to length with hacksaw; screw into socket.

Oil nipple and inside of hose liberally.

Screw nipple into socket and hose.

Install fitting on other end; hose line is ready for use.

Aeroquip
REG. TRADE MARK

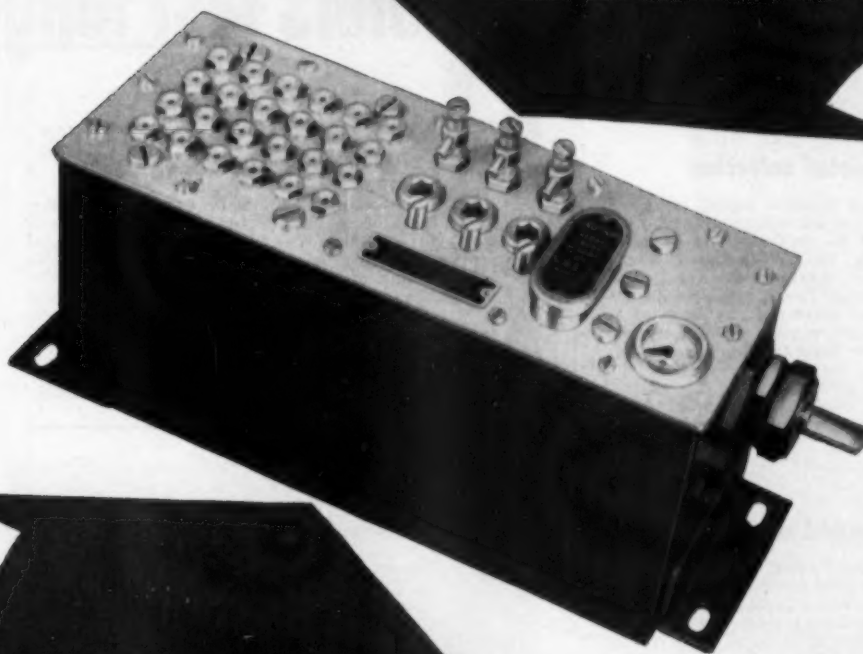
AEROQUIP CORPORATION, JACKSON, MICHIGAN

SALES OFFICES: BURBANK, CALIF. • DAYTON, OHIO • HAGERSTOWN, MD. • HIGH POINT, N. C. • MIAMI SPRINGS, FLA.
MINNEAPOLIS, MINN. • PORTLAND, ORE. • WICHITA, KAN. • TORONTO, CANADA

AEROQUIP PRODUCTS ARE FULLY PROTECTED BY PATENTS IN U.S.A. AND ABROAD

MADISON-KIPP

Fresh Oil
LUBRICATORS



**THE MOST DEPENDABLE
OILING SYSTEM
EVER DEVELOPED!**

**MEASURED FEED
DROP BY DROP
FED UNDER PRESSURE!**

*M*ACHINE performance is in direct relation to the quality of the oiling system! And that's why builders of America's finest machine tools, work engines and compressors specify Madison-Kipp "Fresh Oil" Lubricators as original standard equipment . . . because they provide the most dependable oiling system ever developed . . . measured feed, drop by drop, fed under pressure. There are six models to meet almost every application requirement. Illustrated is the Model FD. Please address all inquiries to the home office in Madison, Wisconsin

MADISON-KIPP CORPORATION

215 WAUBESA STREET, MADISON 10, WIS., U.S.A.

ANCIENS ATELIERS GASQUY, 31 Rue du Marais, Brussels, Belgium, sole agents for Belgium, Holland, France, and Switzerland.

WM. COULTHARD & CO. Ltd., Carlisle, England, sole agents for England, most European countries, India, Australia, and New Zealand.

- *Skilled in DIE CASTING Mechanics*
- *Experienced in LUBRICATION Engineering*
- *Originators of Really High Speed AIR TOOLS*

4

reasons why Trane dry-type fluid coolers last longer

1

Correct metal selection

A wide variety of types of metals are available for highly corrosive applications. Coils can be supplied in combinations of cupro nickel, admiralty, red brass, copper, aluminum, monel, steel, stainless steel and many other special metals. TRANE engineered products have solved corrosion problems of all types, yet obtained maximum heat transfer and maximum life from the fluid circuit.

2

Permanently bonded fins

In constructing the Extended Surface Coil—heart of the fluid cooler—TRANE bonds fin to tube *mechanically*. This bond is as permanent as the metals that form it and as strong as though fin-and-tube were one. Heavy support plates are used to reinforce and protect the coil and prevent tube sagging. And the exclusive TRANE Guide Flange cradles the coil to permit expansion within casing.

3

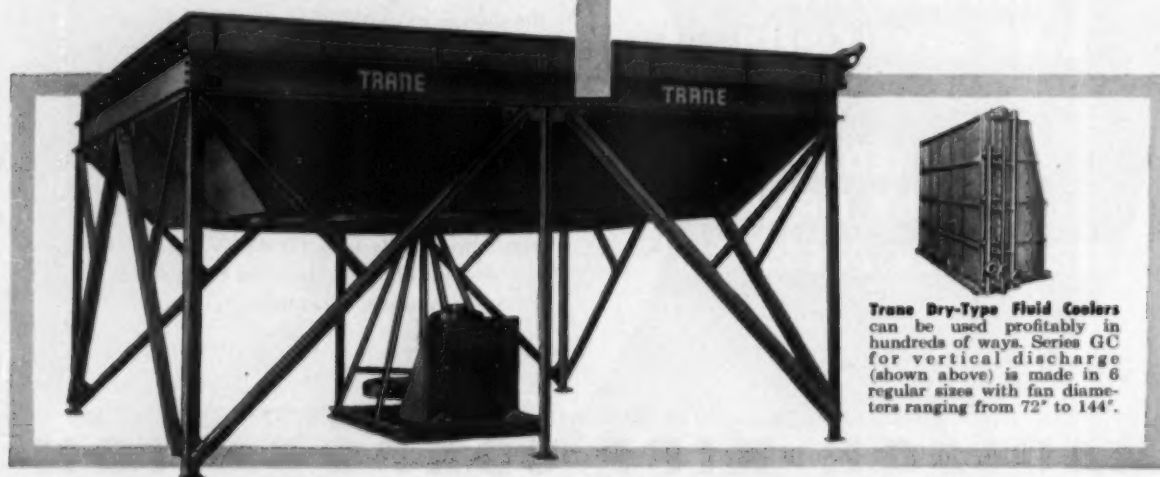
Extra-rugged construction

Framework of the TRANE Fluid Cooler is so strong it can be used for stationary or portable installation *without additional bracing*. Its simple structural design permits fastest possible erection. Yet it is more than strong enough to support core and accessories and withstand wind and shock load. Finish on the TRANE Fluid Cooler is a rubber-base paint that's completely weatherproof.

4

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TRANE Fluid Coolers run smoothly . . . quietly. They stay sound and tight longer because TRANE engineers have virtually eliminated the causes of vibration. Here's how: The variable-pitch fans are dynamically balanced. Solid, oversized fan shaft is firmly mounted in giant thrust bearings. Drive components are aligned at the factory and shipped assembled. Orifice ring is designed to *match* the fan.



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2

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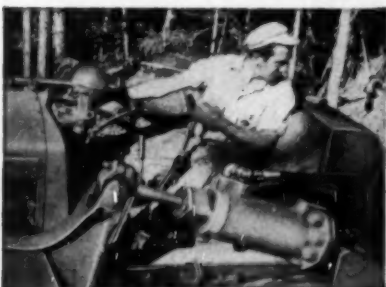
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BESIDES CUTTING OUT ROADS, Riendeau uses his TD 14 to push his truck and a 15-ton load through quagmire road sections.



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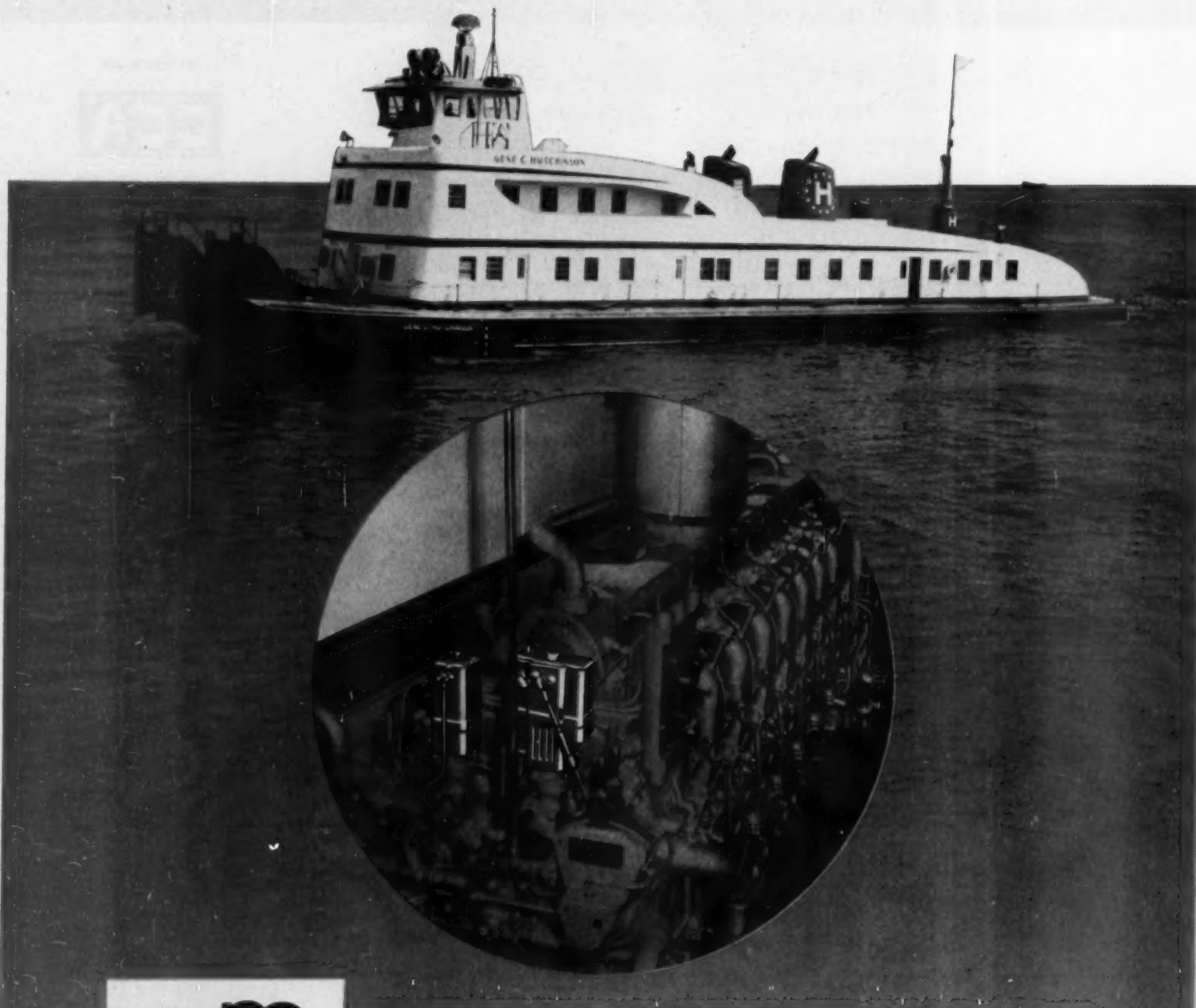
FRONT COVER ILLUSTRATION

Sterling Engine Company President Robert Russell points out operating features of the new Sterling diesel 500 kw. generator set to Board Chairman Joseph W. Frazer. For engineering story and test results see pages 40-41.

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WELLS, MINNESOTA

1600-hp. Fairbanks-Morse Opposed-Piston Engine In Wells, Minn., Municipal Plant Is One of First Of Its Type To Operate on Natural Gas Fuel

By DOUGLAS SHEARING

ONE of the first Fairbanks-Morse opposed-piston engines to operate as a dual-fuel unit has completed its first full year of service in the Wells, Minnesota, municipal power plant. This 10-cylinder Model 38DD8 $\frac{1}{4}$ engine, rated at 1600 hp., at 720 rpm., was installed as an oil-burning diesel in December, 1950 and operated on diesel fuel for the first eight months of 1951. Then the unit was switched to natural gas fuel with diesel oil as a pilot fuel and has run more than 6000 hours as a dual-fuel engine. In its 8-month stint as an oil-burning engine, the OP established itself as the most economical diesel in the plant. Operating 3,664 hours, the engine produced 2,186,700 kwh. while consuming 167,150 gal. of fuel oil, better than 13 kwh. per gal. with an average load under 600 kw. The OP's performance as a diesel is hardly news since engines of this model have functioned successfully for years in a great many heavy-duty installations. The news is the engine's success utilizing natural gas. Utilities Superintendent Howard E. Barton reports that the OP has run smoothly on gas and on one occasion carried a 10 percent overload with the greatest of ease.

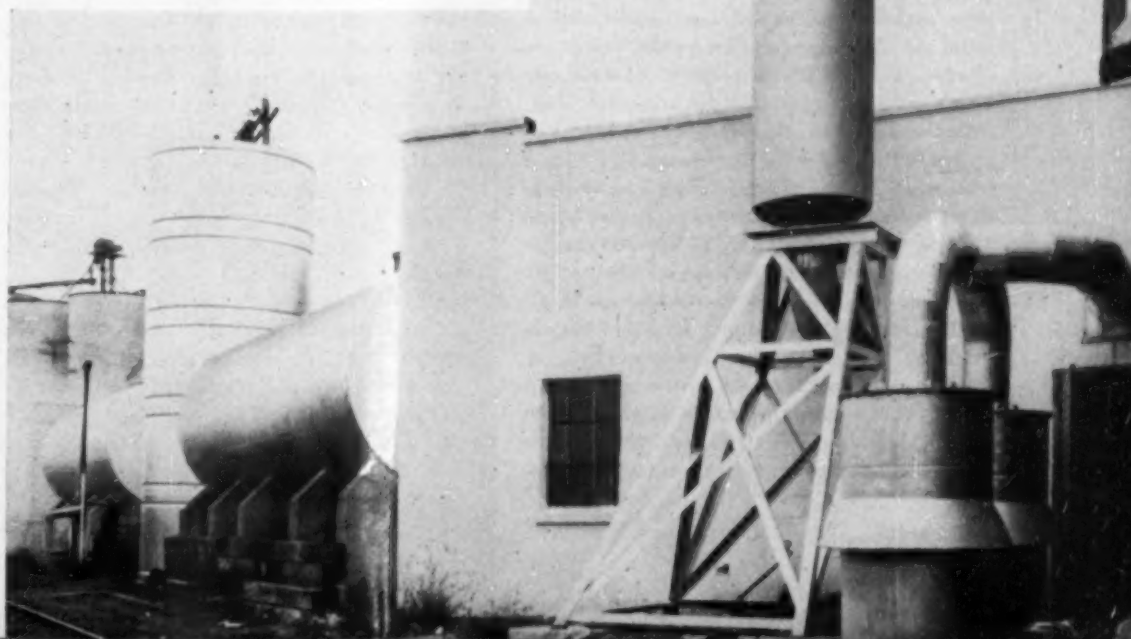
At this writing, figures are available for the first 11 months of dual-fuel service. In this period, the engine ran a total of 6,308 hours, more than 78 percent of the elapsed time. The OP produced 4,861,900 kwh. out of a plant total of 5,892,400 kwh. During the year, the OP ran about 275 hours on oil, generating some 210,400 kwh. on 16,180 gal. of fuel. As a dual-fuel, it produced 4,651,500 kwh. while consuming 62,827,000 cu. ft. of natural gas and 38,790 gal. of pilot oil. The effect on operating costs of these successive changes in fuel is a matter of prime concern. In 1950, the diesel used a crude oil which costs the city 10 cents a gal. and with average consumption at 12.04 kwh. per gal., fuel cost per kwh. was 8.30 mills. In 8 months of 1951 when the OP ran on this oil, average cost per kwh. was 7.64 mills. For the dual-fuel service during 11 months of 1951 and 1952, using a pilot oil at 11.58 cents a gal. and natural gas at 26 cents per mcf., the average fuel cost per kwh. was just 4.47 mills. Compared with costs in 1950, installation of the OP and its subsequent operation on natural gas has meant a fuel saving of more than \$19,000.

There are many ways of determining the solvency and stability of a business enterprise but one of the quickest is to try to borrow money on it. When Wells issued bonds to finance its latest power plant expansion, the interest rate was an unusually low 1 $\frac{1}{2}$ percent with bonds callable at any interest date. A glance at the electric system's financial report on December 31, 1951, shows clearly why the

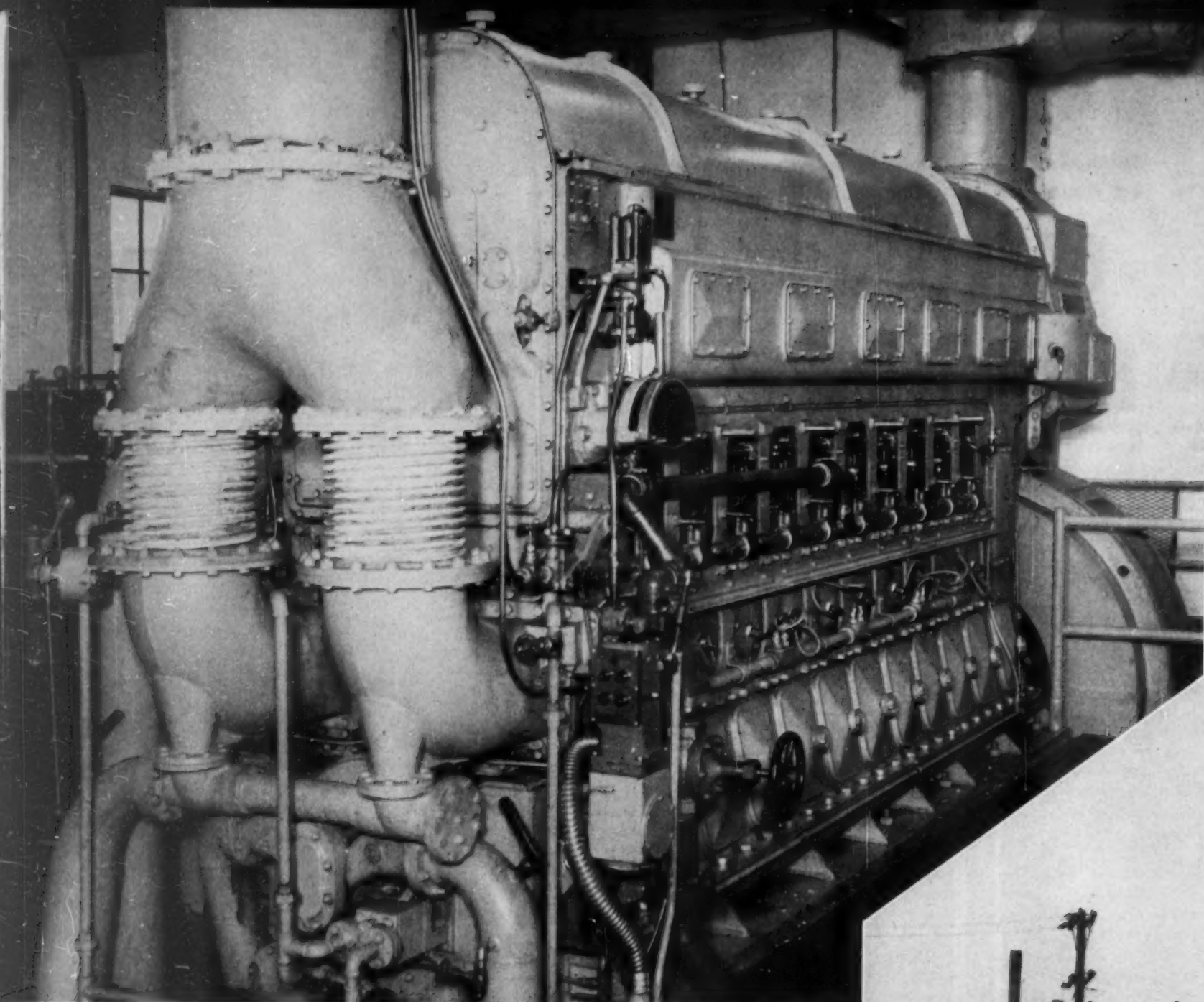
hard-headed bankers considered the Wells power plant so sound an investment. The balance sheet showed that the electric department owned government bonds and interest worth \$146,796.00. Obviously, the city could have bought its new engine for cash, but why liquidate profitable bond holdings when you can borrow money for 1 $\frac{1}{2}$ percent? The statement of revenue and operating expenses for the year 1951 showed how this municipal power system maintains its sound financial condition. Energy sales brought an income of \$151,288.47. Plant operations cost \$65,938.79, distribution \$7,163.41, accounting and collections \$2,870.59, and administration \$2,776.23, for a total operating expense of \$78,749.02. This left an operating profit of \$72,539.45. Of this sum, the department paid \$1,800.00 in bond interest (which was just about balanced by other income), wrote off the water department's electric bill, and paid \$10,000 to the city in lieu of taxes. All this left a net of \$60,311.39. It should be noted that these profits were achieved with only four months of dual-fuel operation. The 1952 figures will be the first to reflect a full year of dual-fuel economy.

Wells is an agricultural community in southern Minnesota with a population of about 2,500. It has built its prosperity on service to its residents and to the surrounding farm population. The stores and other commercial establishments, which consumed 860,564 kwh. in 1951, serve as a shopping center for the farmer. A large part of the 837,775 kwh. purchased by power users went to the two big grain elevators with their attrition mills for grinding feed. The Wells power system serves the

Air for the OP engine is drawn through twin American Cycloil oil-bath filters. Exhaust gases pass through a Burgess scrubber.



Mounted on the wall near the OP engine is a compact F-M gauge and alarm panel with an Alnor exhaust pyrometer and Marshalltown gauges.



This view of the F-M opposed-piston engine shows the gas line and the Woodward governor. Use of natural gas has cut fuel costs to 4.47 mills per kwh.

farmer even more directly, supplying electricity for his home and farm through the REA cooperative. REA took 2,480,000 kwh. in 1951, about 45 percent of the plant's total sales. Residential consumers in town purchased 945,322 kwh. In all classifications, rates compare favorably with other similar communities and the average price was \$0.0279 per kwh. in 1951. There is a fuel clause in the REA contract and the average in 1952 should be even lower. This community has been providing electricity to its citizens since 1895 when a small steam plant went into service. The city switched from steam to diesel in 1931 with the installation of three Model 32 Style VA Fairbanks-Morse diesels, one rated at 300 hp., another at 240 hp. and the third at 120 hp. Four years later, the plant added a 600 hp. Model 33D12 Fairbanks-Morse diesel. It was another ten years, with a war intervening, before Wells secured another F-M diesel, this time a Model 33F16 engine rated at 1400 hp. Then, the latest addition came in December 1950 when the 1600-hp. opposed-piston engine was installed.

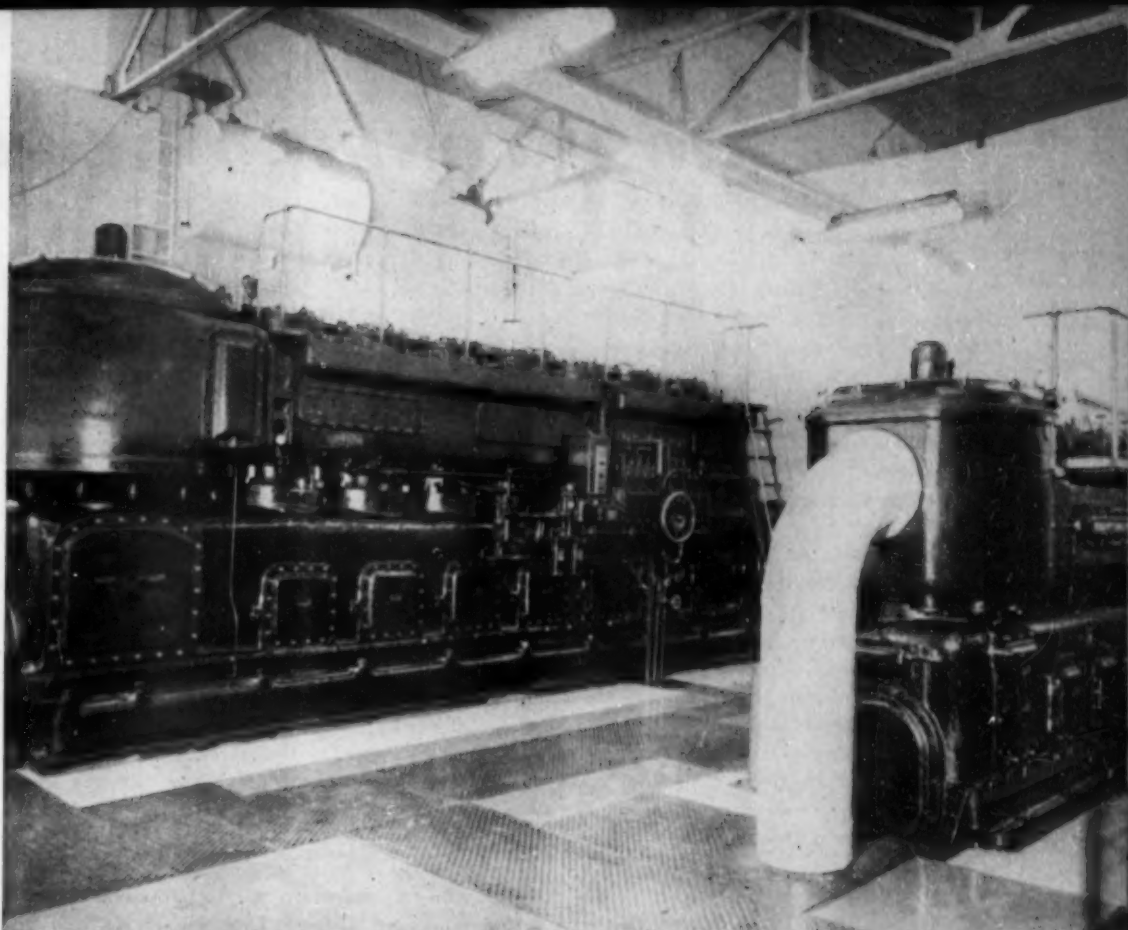
Though placed in an L of the plant, separated from the other engines, the OP is integrated with the rest of the prime movers. For example, all engines are on a common jacket water header. Two motor-driven centrifugal pumps circulate the soft water through the engines and through coils in a 3500-hp. dual forced-draft cooling tower. Another pair of pumps puts raw water through the tower spray nozzles. To control water temperature, there are automatic thermostatic valves to bypass raw water around the nozzles and automatic controls for the tower shutters. The fans are manually controlled. A high detergent lubricating oil is used in the pressure system of the opposed-piston engine and some of this oil is bypassed through a 10-element cellulose filter. Mr. Barton has noted that the engine runs cleaner when using gas fuel and the lube remains in excellent condition after thousands of engine hours. The lube system for the OP includes a shell-and-tube oil cooler with automatic thermostatic bypass valve, and a motor-driven auxiliary lube pump. Fuel, of course, is the big story



at Wells. At the time of this reporter's visit to the plant, Mr. Barton was using a gas oil of 32 to 36 gravity for pilot fuel in the OP and a good quality Texas crude for all the other engines. It is his intention to switch the OP to the cheaper crude oil which will effect further economies in the engine's fuel cost per kwh. The plant has three 20,000-gal. fuel storage tanks from which the oil is pumped through filters and meters to underground day tanks outside the building. The built-in engine supply pumps pick up fuel from the day tanks and send it through additional filters to the injection pumps. The natural gas for the OP comes to the plant through a 4-in. line at 43 lb., passes through a meter and regulators to reach the engine at 19 lb. Governor controls are arranged so that the engine can operate on gas plus pilot oil or wholly on oil. The unit switches automatically if pilot oil or lube pressures fail.

This municipal power plant is a valued citizen, contributing to the general welfare of the community. First, it performs its primary job of providing dependable service at moderate rates. Sec-

The Wells, Minn., municipal power plant with its Fairbanks-Morse diesels and dual-fuel engine is a highly profitable enterprise, earning a net profit of \$60,000.00 in 1951. At right, is the Diesel Service cooling tower.



Besides the new OP, major prime movers in the Wells plant are the 1400-hp., Model 33F16 Fairbanks-Morse diesel, at left, and the 600-hp. Model 33D12 F-M diesel, at right.

ond, it contributes \$10,000 a year in lieu of taxes, helping to pay the costs of city government. Third, it has built up substantial cash reserves which can be used for plant improvements or civic projects. Fourth, it has financed many public improvements. Since 1949, it has contributed \$20,000 for a well and pump, \$20,000 for a mercury vapor street lighting system, and \$65,000 to the local hospital. Now, aided by dual-fuel economy, the plant can be expected to continue its record of dependable performance and public service.

List of Equipment

Engine—One 1600-hp., 10-cylinder, 720 rpm., Model 38DD8½ engine. Fairbanks, Morse & Co.
 Alternator—One 1420 kva., 1136 kw., 3-phase, 60-cycle, 2400 volt, 80% pf. alternator with 10 kw. V-belted exciter. Fairbanks, Morse & Co.
 Governor—Woodward.
 Gas pressure regulator—Fisher.
 Fuel filters—Nugent.
 Fuel meters—Buffalo Meter.
 Fuel level meter—Levelometer.
 Lube oil—Standard Oil (Indiana).
 Auxiliary lube pump—Roper.
 Lube oil cooler—Ross.
 Temperature control—Fulton Sylphon.
 Lube oil purifier—Renuoil.
 Forced-draft cooling tower—Diesel Service Co.
 Thermostatic valves—Powers.
 Air filter—American Air Filter.
 Snubber—Burgess-Manning.
 Switchboard—General Electric.
 Pyrometer—Alnor.

RIO ESCONDIDO RE-POWERED

By DOUGLAS SHEARING

REPOWERED with two 500 hp. Nordberg direct drive, direct-reversing supairthermal marine diesel engines, the M/S *Rio Escondido* has been returned to regular service following a series of sea trials that saw her attain a speed of 12 knots.

The twin screw vessel is assigned to general cargo service between Corinto, Nicaragua and New Orleans with other calls at American Gulf ports. Owned and operated by Marina Mercante Nicaraguense, a private shipping company with headquarters in Managua, Nicaragua, the *Rio* is the largest of the firm's fleet of cargo vessels. Colonel Anastasio Somoza is president of the firm. Captain Bror E. Gentzschlein, master of the *Rio Escondido*, is also Marine Superintendent and principal director of the company's marine activities.

The *Rio Escondido* is a converted British LCT with a 238 ft. length, 38 ft. beam and 14 ft. draft. She was built as an all riveted steel vessel. When converted to a cargo ship in Norway, welded sections of molded bow and stern were attached to the existing hull to improve her lines and sea going ability. This also provided for a raised forecastle head which gives the vessel better performance in rough weather. Basic reason behind the repowering of the *Rio* was the vessel's inability to reliably

maintain schedules with her four original high speed diesel engines. These engines were each rated 400 hp. at 1500 rpm. and powered the twin screws through 1.5:1 reduction gears. Because of their high speed design the engines were not well suited to continuous operation at overload conditions which on occasion resulted in the failure of this propulsion machinery. With the heavy duty direct drive supairthermal engines, Marina Mercante Nicaraguense officials realized they could operate at much lower engine rpm., eliminate power loss through a reduction gear and obtain improved engine reliability and propeller efficiency. This was shown during trials when the *Rio* ran 12 knots, well above the speed attained with the former propulsion units.

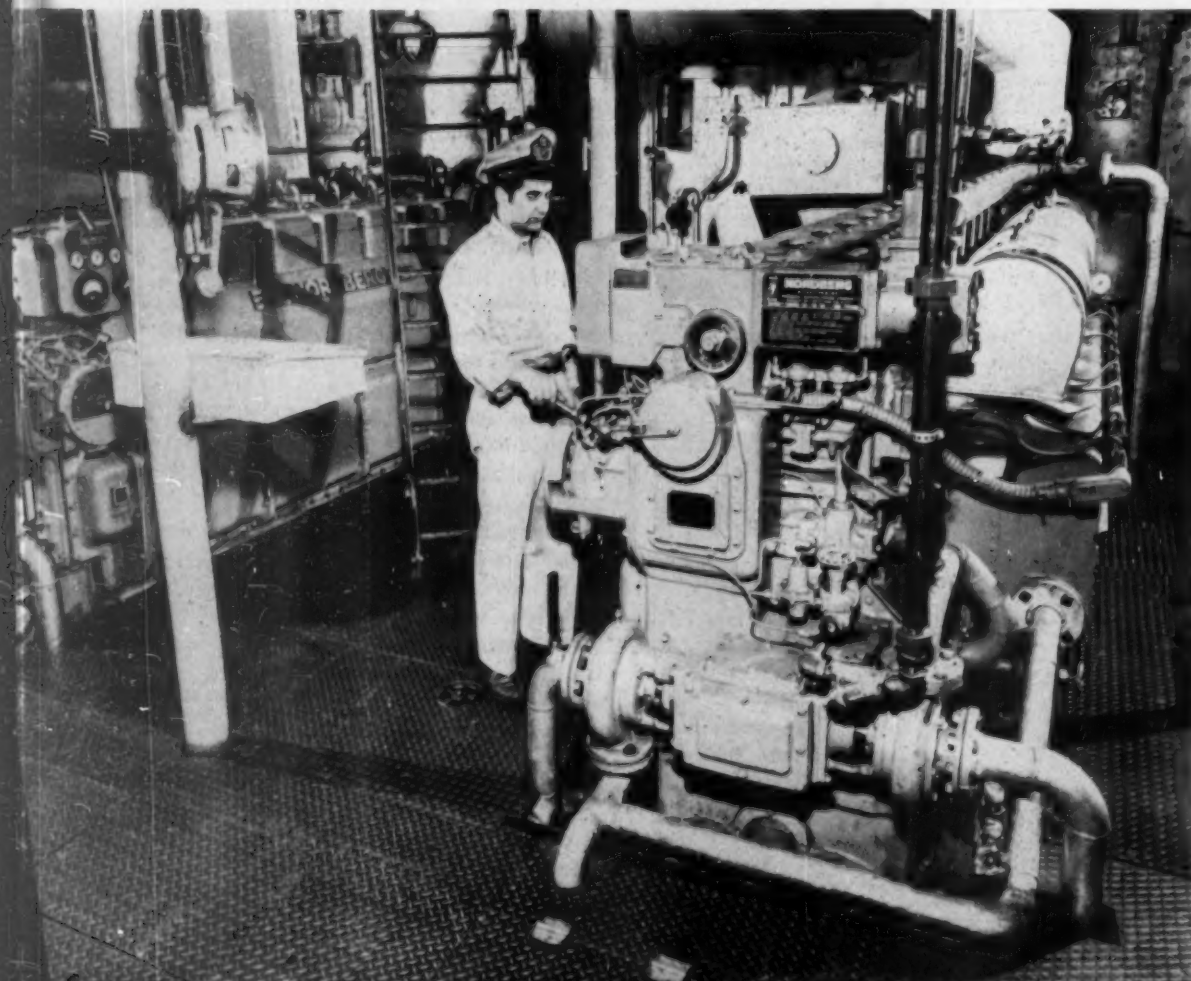
Installation of the two compact Nordberg propulsion units was made to the requirements of Lloyds Bureau of Shipping. The work was carried out to the owner's complete satisfaction by Pacific Drydock Company, Oakland, California under the direction of Manager Earl Wiley and his assistant, Andy Larson. The Nordberg supairthermal engines propelling the *Rio Escondido* are right and left hand direct drive, direct reversing, four cycle units with eight cylinders of 9 in. bore and 11½ in. stroke. Each engine develops its normal rating of

500 hp. at 500 rpm. Propulsion is through two new 50 in. diameter by 37 in. pitch propellers procured from Coolidge Propeller Company in Seattle. The propeller shafts outside the hull are supported by large struts and strut bearings at the propeller end. Two rudders, located each immediately behind their respective propellers, give the vessel excellent steering qualities.

The supairthermal engines are installed in the engine room at the aft end of the main hold, and are spaced on approximately 12 ft. centers. By installing two propulsion units instead of the original four diesel engines, easy access is afforded to all principal and auxiliary machinery and maintenance cost, of course, will be substantially lower. All auxiliaries for the propulsion engines are located in the main engine room. Two motor driven

Control end of the two 500 hp. Nordberg supairthermal diesel engines propelling the *Rio Escondido*. At the base of the engine shown (left) is the raw water pump and (right) the jacket water pump.

20



air compressors, one automatic and the other with manual control, supply starting air which is stored in two 18 in. x 76 in., 250 psi. starting air tanks. One motor driven fuel transfer pump takes fuel oil from double bottom tanks. It then pumps it through strainers and a Winslow fuel oil filter into the main engine supply and settling tanks from which each main engine draws its fuel.

The engines have attached, positive displacement, lube oil pressure and lube oil scavenging pumps with two 150 gal. lube oil sump tanks with strainers and two Winslow 14-1645 lubricating oil bypass filters. Two motor driven 50 gpm., 50 lb. pressure lubricating oil standby pumps are also installed and either may be used for emergency pressure supply to the engines or scavenge service from the engines. A Ross lubricating oil cooler is provided for each engine. Jacket water system on the *Rio Escondido* consists of an attached engine driven jacket water and seawater centrifugal type circulating pumps. Sea water pumps take their suction from main sea suction, through strainers and deliver water first to the intercoolers on the supair-thermal engines. The cooling water is then passed to the lubricating oil cooler, through the jacket water heat exchanger and overboard. A tap off the

sea water circulating line, between the intercooler and the lubricating oil cooler, provides salt water service to the water lubricated Reyertex stuffing boxes and stern bearing glands.

The exhaust outlet from the turbochargers, located on the after end of the Nordberg engines, extends upward through flexible metal exhaust tubing to Maxim SC spark arrestors and then through long tail pipes to the top of the stack. Two motor driven fire and general service pumps are provided in the wings of the main engine room and two motor driven auxiliary circulating pumps, available from the original installation, provide emergency circulation for the main propulsion engines. The auxiliary engine room, located aft of the main engine room, houses six Paxman four cylinder, 30 kw., dc. auxiliary generating sets. One or two of these units are sufficient for operation at sea and four are used for power when working cargo in ports. These units were part of the original installation and still offer dependable service.

Since its conversion in Norway, the vessel offers spacious crew accommodations. In addition, the deck house, bridge and wheel house were built onto the ship aft and ample room was provided

for a separate hospital, dining saloon and super-cargo room. Due to the vessel's boxlike main structure, the hold is open from the forward bulkhead all the way aft to the engine room bulkhead. This large square hold is served by two large hatches with double booms and electric winches for each hatch. A single mast forward and at the bridge and intervening king posts provide support for the cargo booms. A large electric anchor windlass on the forecastle head serves the ship with two large anchors. Both are frequently used in Central American ports for mooring and navigational purposes.

List of Equipment

Propulsion engines—Nordberg four cycle, eight cylinder, 9 in. x 11½ in., direct drive, direct reversing supairthermal diesel engines, 500 hp., 500 rpm.

Auxiliary generating sets—Paxman, 30 kw., dc.

Jacket water coolers—Ross.

Lube oil coolers—Ross.

Fuel oil filters—Winslow.

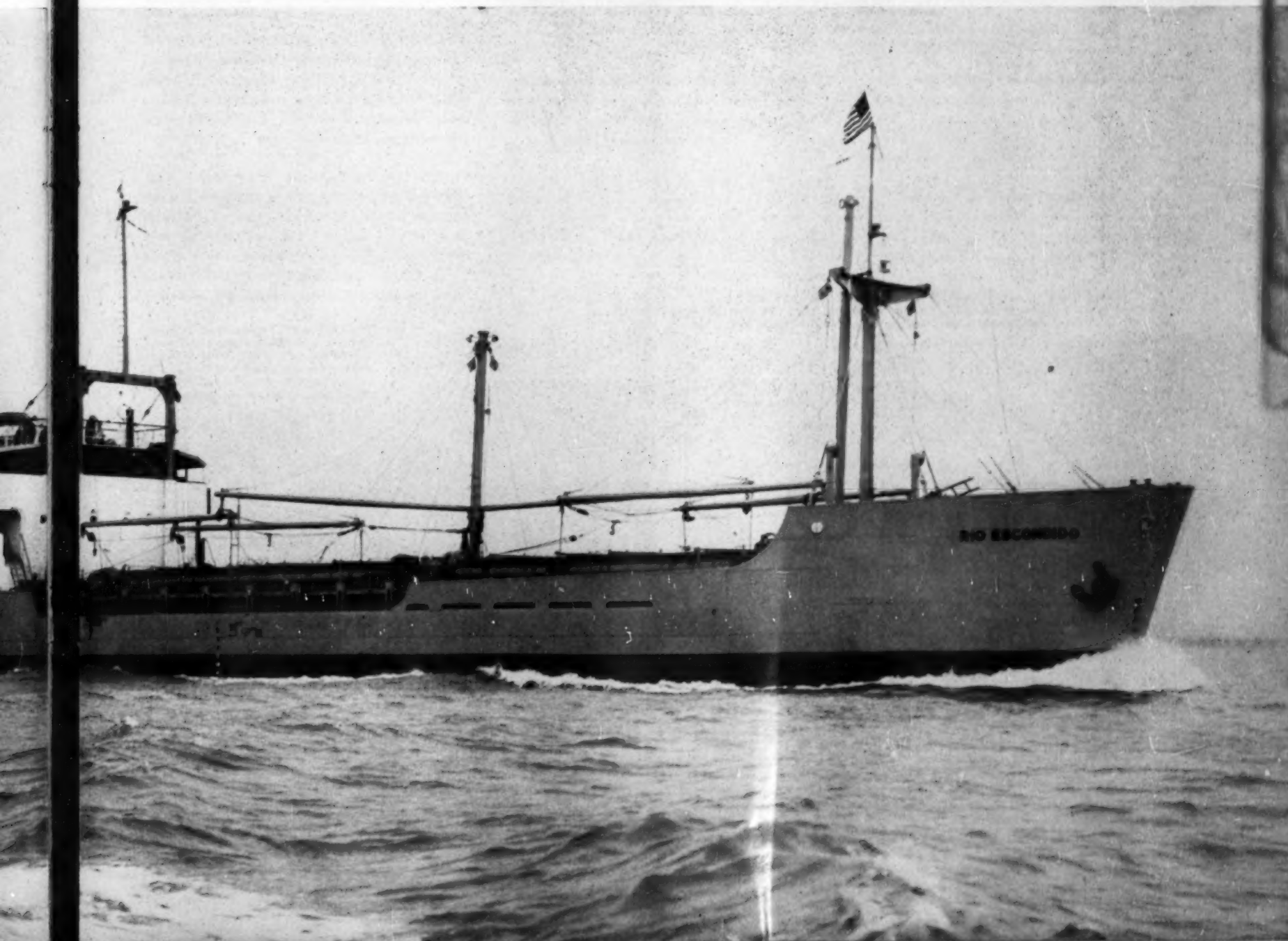
Lube oil filters—Winslow.

Air compressors—Quincy.

Exhaust silencers—Maxim.

Pyrometers—Alnor.

Spark arrestors—Maxim.





Cornelia Campbell crowned "Queen of the Brush" and her "maids of honor" at the second annual Brush Clearing Demonstration, Paris, Texas, June 25, 1952.

CCHEERS mingled with the roar of giant tractors as the tangled growth of generations fell before the onslaught of mighty bulldozers. The "King of the Brush," a powerful crawler tractor, was in action again at the Second Annual Brush Clearing Demonstration near Paris, Texas, June 25. The demonstration proved to thousands of ranchers and farmers from Texas and neighboring states who attended the project that brush-covered, useless land could be quickly and cheaply reclaimed

for profitable productivity. Contractors used the "champion of crawlers," International Harvester's TD-24, supplemented by the smaller TD-14 to smash down, root out and windrow scrub growth.

The "big act" of the day was a team of International TD-24's coordinating on a tree-smashing activity, each pulling one end of 300-feet of 2¼-inch anchor chain weighing 25,000 pounds. Contractor C. G. Thompson of Paris, Texas, thrilled

Contractor C. G. Thompson's International TD-24 crawler and Bucyrus-Erie dozer pulling a Marden duplex brush cutter, clearing brush and scrub trees and chopping fallen residue at second annual Brush Clearing Demonstration, Paris, Texas, June 25, 1952.



Contractor John D. Wright of Talco Texas, used his International TD-24 equipped with Bucyrus-Erie, cable operated bulldozer to windrow trees and brush on 5-acre demonstration

the crowd with his fast-moving exhibition of "chaining" noxious growth. This event pointed out the possibilities of fast brush-clearing which, when followed up by bulldozers removing stumps and tractor plowing and disking, puts useless land in productive condition at low cost.

Paris News publisher, A. G. (Pat) Mayse, originator and co-sponsor of the annual demonstrations said that he saw a "mechanized miracle," a 5-acre parcel of rank growth transformed to tilled land ready for seeding, between ten in the morning and 2 o'clock in the afternoon. Mayse added, "I'd have called the man a liar who said it could be done—

The "Big Act" of second annual Brush Clearing Demonstration at Paris, Texas, June 25, 1952, was the "chaining" operation. Using 300 feet of 2¼-in. link marine anchor chain, weighing 25,000 lbs., a team of International





plot at Paris, Texas Brush Clearing Demonstration, June 25, 1952. Five acre plot was cleared and tilled between the hours of 10 a.m. and 2 p.m. of the same day.

then I saw it happen with my own eyes." Contractor John Wright used an International TD-24 with a Bucyrus-Erie dozer-tree smasher on the record-breaking, brush-clearing operation to which Mayse referred. Huddleston Construction Company, Bogata, Texas, demonstrated a Bucyrus-Erie dozer-equipped International TD-14 crawler on the same plot. Contractor C. G. Thompson followed through with dozer, tree smasher, and Marden brush cutter to do the 5-acre clearing job that amazed publisher Mayse and the thousands of rancher-farmer spectators. All three contractors received enough orders for brush clearing to keep them busy for years to come.

TD-24 crawler tractors owned by C. G. Thompson, Paris contractor, gave a thrilling and eye-opening demonstration of fast and thorough brush clearing. Scrub trees and noxious underbrush fell before the onslaught.

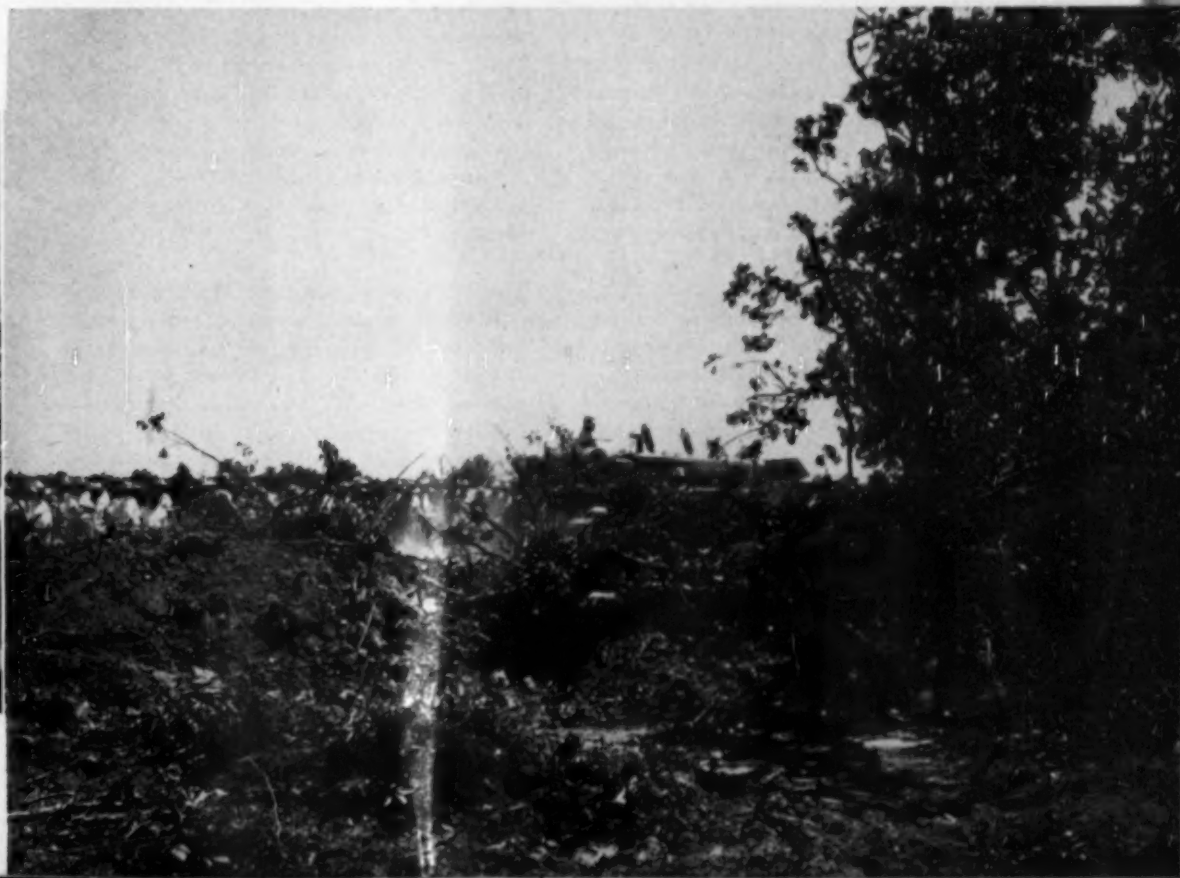


International TD-24 crawler tractors equipped with Bucyrus-Erie cable-operated bulldozer and Rome tandem disk harrow, in disking operation after brush clearing. Disking with heavy harrow chops residue and prepares land for seeding. Five acre plot was cleared and tilled between the hours of 10 a.m. and 2 p.m., June 25, 1952, during annual Brush Clearing Demonstration, Paris, Texas. Contractor, C. G. Thompson, Paris, Texas, did the disking.

Browning-Ferris Machinery Company. International Harvester distributor, was on hand from Dallas to help quench thirsts with 150-gallons of refreshing ice water dispensed from oak barrels at their headquarters booth. Millions of acres of scrub brush and tree-covered land lie dormant and valueless in the South. Texas has its share of this

non-productive land covered with brush which, if removed, would create a vast area of pasture and crop acreage. The demonstration at Paris and the continuous land-clearing activities on Texas ranches by enterprising contractors using heavy machinery will open up new vistas of agricultural wealth in this Southland empire.

Useless native scrub oak and rank brush were uprooted and windrowed by International TD-24 crawlers owned by contractor, C. G. Thompson at second annual Brush Clearing Demonstration, Paris, Texas, June 25, 1952.



SAN ANTONIO, TEXAS

Dual Fuels for Pumping Cut San Antonio Costs. Three 390-hp. Fairbanks-Morse Engines Drive 8,000,000 Gpd. F-M Pumps to Lead City in Economy

NOT far from the Alamo, a number of deep artesian wells are furiously flowing to help quench San Antonio's ever-growing thirst. Impelled by subterranean forces, this water arrives at the surface of the ground at a pressure of about 10 psi. after a 1300 to 1600 ft. rise, but it still needs man's help to travel through the city's sprawling mains. At Mission pumping station, three 390-hp. Fairbanks-Morse dual-fuel engines driving 8,000,000 gpd. F-M centrifugal pumps are doing an increasing share of the pumping job. These units have reduced power costs more than 60 per cent, achieving the lowest operating cost in the entire San Antonio, Texas, water system.

Mission Station (officially Pumping Station No. 4) located in Concepcion Park, was built originally in 1922. The original station had three electric motor-driven pumps: one 8,000,000 gpd., 400-hp. DeLaval, one 6,000,000 gpd., 250-hp. Allis-Chalmers, and one 4,000,000 gpd., 200-hp. Fairbanks-Morse. All were centrifugal pumps driven by 3-phase, 2300-volt electric motors. These pumps raised the water's pressure from its natural 10 psi. to 97 psi. for distribution to the city water system. The station was intended as a standby installation but rapid postwar increase in water consumption necessitated expansion and regular use of the station. In 1949, the city put into full operation three 8,000,000 gal. per day Fairbanks-Morse centrifugal pumps driven by three 6-cylinder model 31AD8½ Fairbanks-Morse dual-fuel, each rated at 390 hp. at 514 rpm. The engines drive the pumps at 1045 rpm. through herringbone gears.

Within a radius of about 250 ft., there are 10 artesian wells with diameters ranging from 10 to 20 ft. and depth of 1300 to 1600 ft. All the wells are connected to one 28-in. header which runs the length of the plant. The new pumps are single-stage, double-entry centrifugals with 14-in. suction, 12-in. discharge and 23½-in. impellers. The pumps discharge into two 20-in., one 18-in. and one 12-in. outgoing mains.

Since installation of the new pumps and engines, the station has been called on for large volume service. It handled 16,500,000 gal. per day last summer with an evening peak at a rate of 22,000,000 gpd. Even in the winter the station pumps as much as 7,500,000 gal. per day. The engine-driven pumps do the bulk of the work with the old electric pumps maintained in operating condition for true standby service. During the first three full years of service, the dual-fuel units handled 7,317,000,000 gal. of water. The dual-fuel engines, which utilize cheap natural gas as their principal fuel, demonstrated conclusively that important economies could be achieved as compared with the cost of pumping with purchased power.

In the years 1949, 1950 and 1951, the engines consumed fuel costing a total of \$25,356.40 in pumping 7,317,000,000 gal. This represented an average cost of just \$3.46 per million gal.

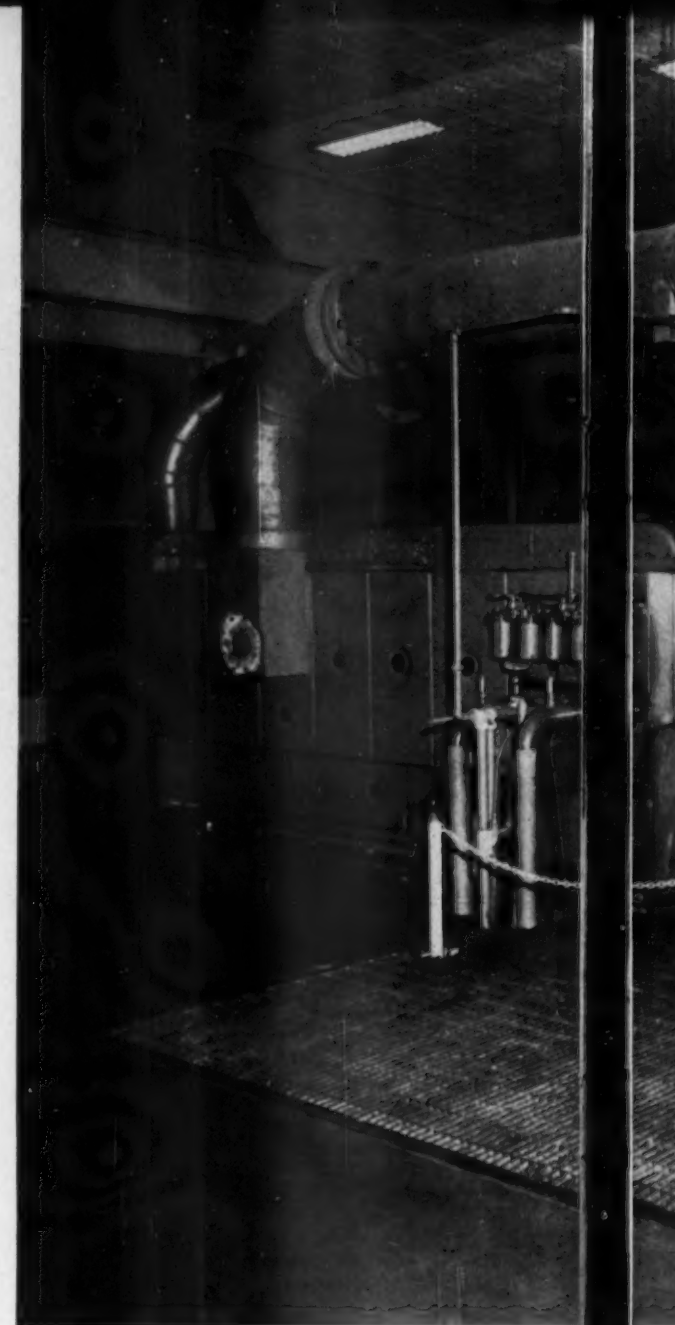
It is difficult to make direct cost comparisons since the station switched from standby and peaking service to full-time operation at the time the new equipment was installed. Including the cost of standby service from the power company, it cost an average of \$53.10 per million gal. to pump 77,192,000 gal. with the electric-driven pumps in 1949 and \$21.65 per million to handle the 209,363,000 gal. pumped in 1950. In 1947, the last full year of typical electric operation, the volume of water pumped was 674,000,000 gal. and the average power bill per million gal. was \$21.30.

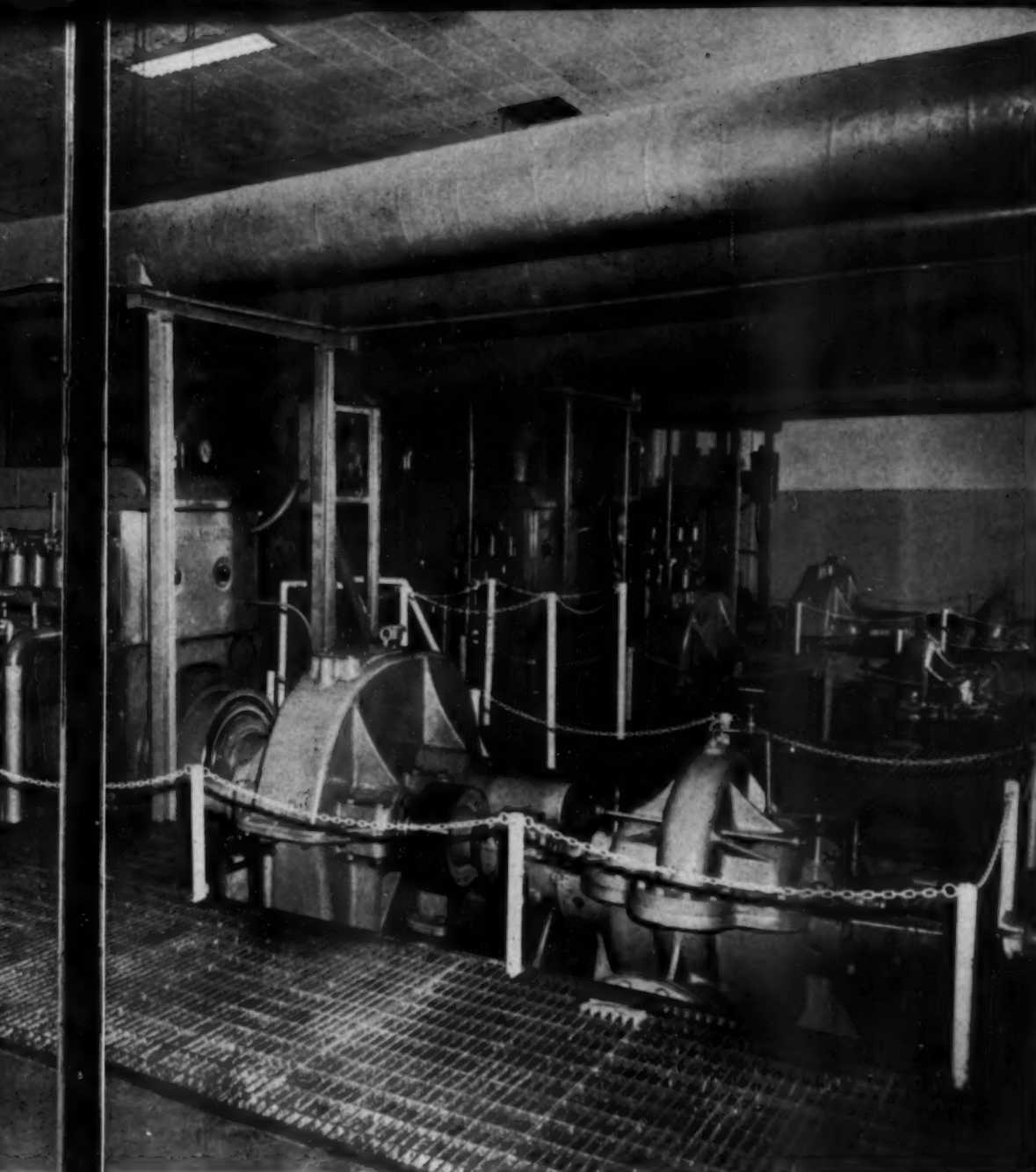
Plant engineers calculate that the fairest figure to compare with the \$3.42 fuel cost per million gal. achieved by the dual-fuel units would be about \$9.00 per million gal. This would allow for the increased economy of greater volume and would exclude labor, supplies and depreciation. On this basis, the dual-fuel engines have cut costs \$5.54 per million gal., a reduction of more than 60 per cent. This amounts to a saving of more than \$40,000.00 for the three years 1949 through 1951. The basis of this dual-fuel economy is efficient operation on low-cost fuel. Natural gas is abundant in Texas and these engines use just 4.6 cu. ft. of gas to pump 1,000 gal. of water. A small constant charge of diesel fuel is injected to insure ignition of the gas. Each engine uses 2 gal. of pilot oil per hour. Lubricating oil is circulated throughout each engine by a built-in pump. Included in this pressure circuit are a full-flow filter and a shell-and-tube oil cooler. Some lube is by-passed continuously from the pressure system through a multi-cartridge cellulose filter. Lube consumption has been just 2 gal. for 24 engine hours. This means a good 4,680 rated hph. per gal. of lube.

The steady flow of water from the artesian wells provides an excellent source of cooling water. Raw water at 70°F. is bled from the suction header and put through the oil coolers and jacket water heat exchangers, after which it is pumped back into the line by engine-driven centrifugal pumps. Each engine has a separate soft water circuit with an engine-driven centrifugal pumping water through engine jackets and the heat exchanger. The soft water at 15 psi. enters the engine at 142°F. and exits at 160°F. Scavenging air is drawn from outside the plant through oil bath filters. Each filter uses 18 gal. of lube oil which is replaced each 6 months if conditions are very dusty. Exhaust gases vent through vertical silencers outside the plant.

Control equipment for the plant is compact and complete. A single lever on the engine is used to stop and start the engine and also can be used to switch instantly from dual-fuel to full diesel operation. Adjoining the control lever are the governor and an emergency shutdown control. Beside each engine is a separate panel with gauges, exhaust pyrometer and an automatic alarm system. The plant has a central control panel which indicates and records suction and discharge pressures, and pumping rate of each engine-driven pump. There is also a tachometer to show rpm. of each dual-fuel unit.

Chief Engineer F. A. Sturm reports full satisfaction with the performance of the engines and pumps. Maintenance is kept to a minimum but a program of preventive care is followed to keep equipment in peak condition. Pistons are pulled for inspection once a year. One important advantage of engine-driven pumps in a city water system is their independence of outside power which might be interrupted in time of storm. There have been power failures in the southern section of San Antonio but fire danger was minimized because the area was served by Mission Station's engine-driven pumps.





The San Antonio water system is administered by an autonomous group of trustees known as the City Water Board. Although the Mayor is a member during his term of office, the board functions independently of the municipal government. The system operations have been directed for more than 35 years by Manager W. D. Masterson. His assistant, R. A. Thompson, Jr., directed the design of the Mission Station. More than 5 years of experience at Mission Station have proved that these dual-fuel engines provide a dependable source of power for pumping and effect substantial economies in operating costs.

List of Equipment

Engines—Three 390-hp., 6-cylinder, 2-cycle, Model 31AD8½, dual-fuel engine operating at 514 rpm. Fairbanks, Morse.

Pumps—Three 8,000,000 gpd., 12-in. Fig. 5814, 14-in. suction, 23½-in. impeller, 1045 rpm., single-stage centrifugal, double-entry pumps. Fairbanks, Morse.

Lube oil—Texaco Ursa.

Fuel filters—Purolator.

Lube filters—Full-flow, Cuno.

Exhaust silencers—Maxim.

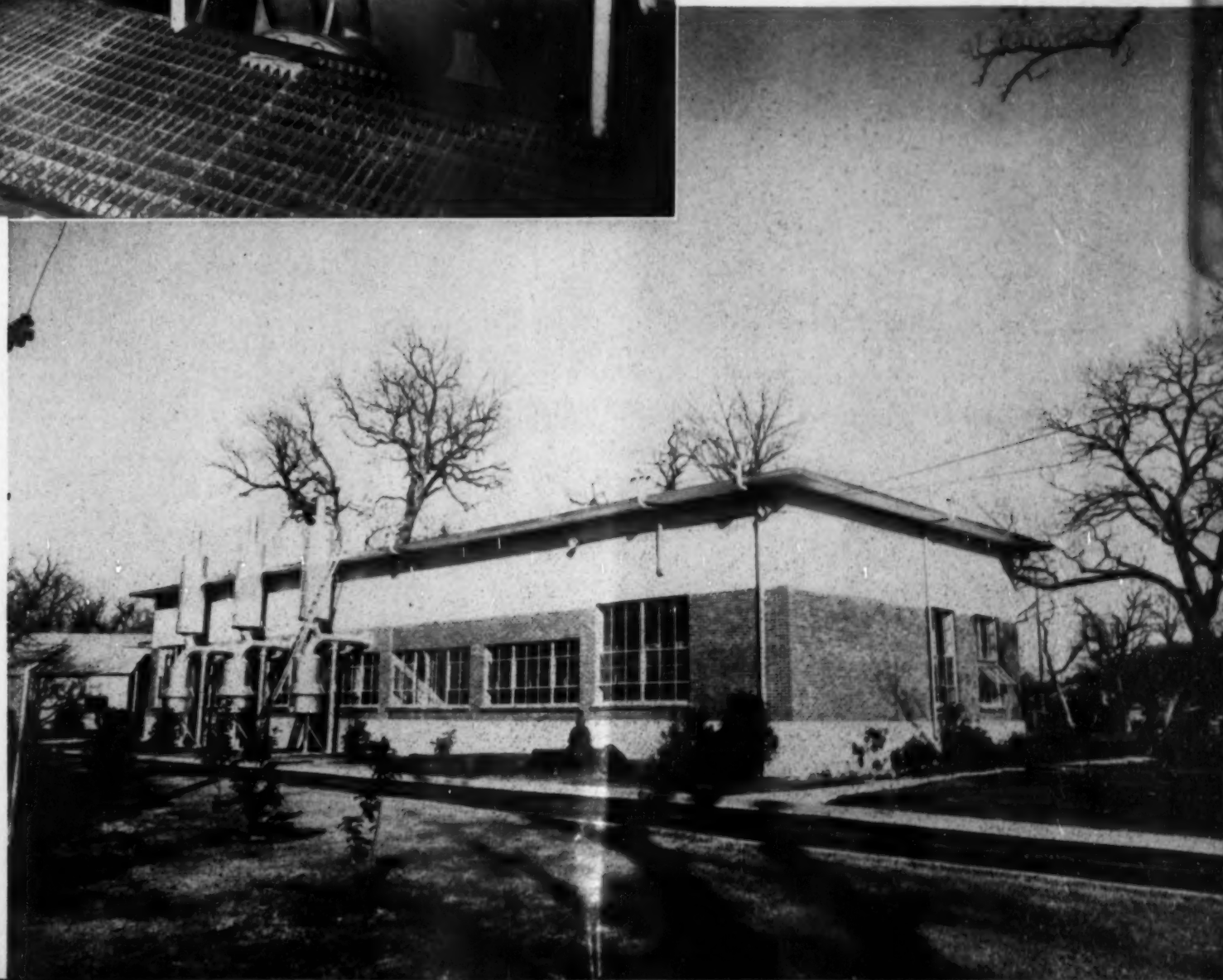
Air filters—American Air Filter.

Exhaust pyrometers—Alnor.

Tachometers—Weston.

Oil cooler—Ross.

Heat exchangers—Ross.



BARRY DEAN DELIVERED TO ROSE BARGE LINE

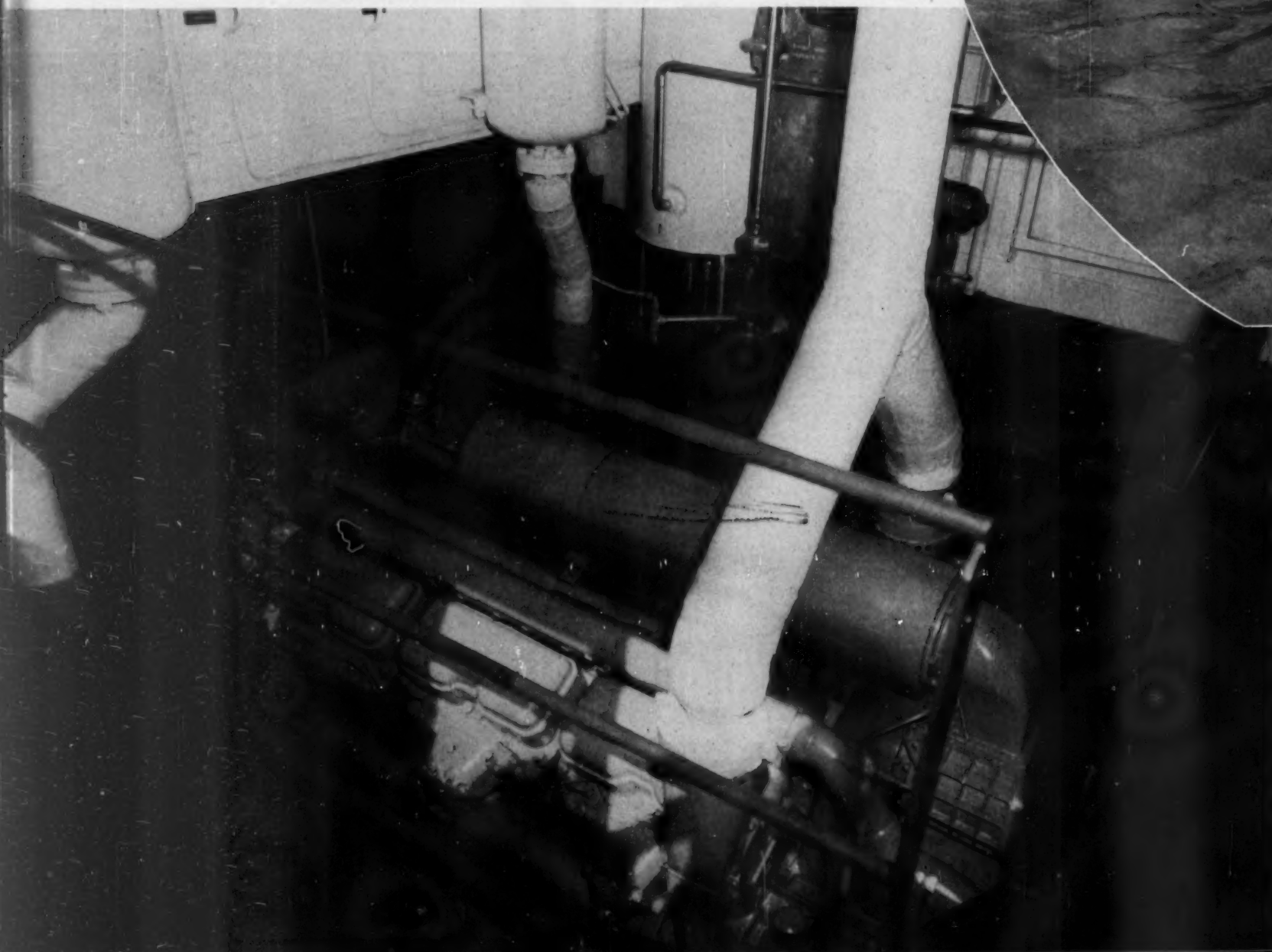
By DOUGLAS SHEARING

THE new rose-colored towboat *Barry Dean* is not only unusual in appearance but is proving to be an amazingly good performer. Designed and built by the St. Louis Shipbuilding & Steel Co. for the Rose Barge Line, of Marseilles, Illinois, the *Barry Dean* is equipped with a retractable pilot house for low bridge clearance.

The hull is 68 ft. x 19 ft. x 8 ft. with a normal draft of 5 ft. 6 in. and is constructed on the transverse framing system. The bow is a modified scow type and the tunnel is well rounded both longitudinally and transversely. The bottom, bilge and side plating is $\frac{3}{8}$ in. The deck and all bulkheads

are $\frac{1}{4}$ in. Bulkheads are stiffened both vertically and horizontally. The all welded steel deckhouse has accommodations for 10 men. The quarters and pilot house are insulated with 2 in. of Ultralite #75 and sheathed with $\frac{1}{4}$ in. tempered Masonite. Steel sash and steel outside doors are used throughout.

Propulsion is provided by a Caterpillar D-397 marine diesel rated 400 hp. at 1200 rpm. There is fitted a Falk 4:1 ratio reverse-reduction gear turning the 66 in. diameter cast steel propeller at 300 rpm. Engine speed and the reverse-reduction gear are controlled directly from the pilot house by means of Caterpillar pneumatic controls with built-in





time delays. This time delay prevents the inflation of the ahead and the reverse pneumatic clutches at the same time. For increased push-power the *Barry Dean* is equipped with a St. Louis Ship's Kort nozzle and a Contraguide rudder.

The boat has two electro-hydraulic follow-up type steering systems, one for the Contraguide steering rudder and one for the two flanking rudders. Electric power is furnished by two Caterpillar D311, 20 kw., 125 volt dc. generator sets. A 12 cfm. Gardner-Denver air compressor furnishes air for engine starting, engine controls, air horn, etc. The vessel is equipped with a pair of Burgess-Manning snubbers and a 1 hp. motor driven Goulds bilge pump. A Schoellhorn-Albrecht B4 hand capstan and two 5 ton Beebe hand winches are installed on the forward deck. Two 14 in. arc, 25 amp. Carlisle & Finch searchlights are mounted at the forward corners of the pilot house.

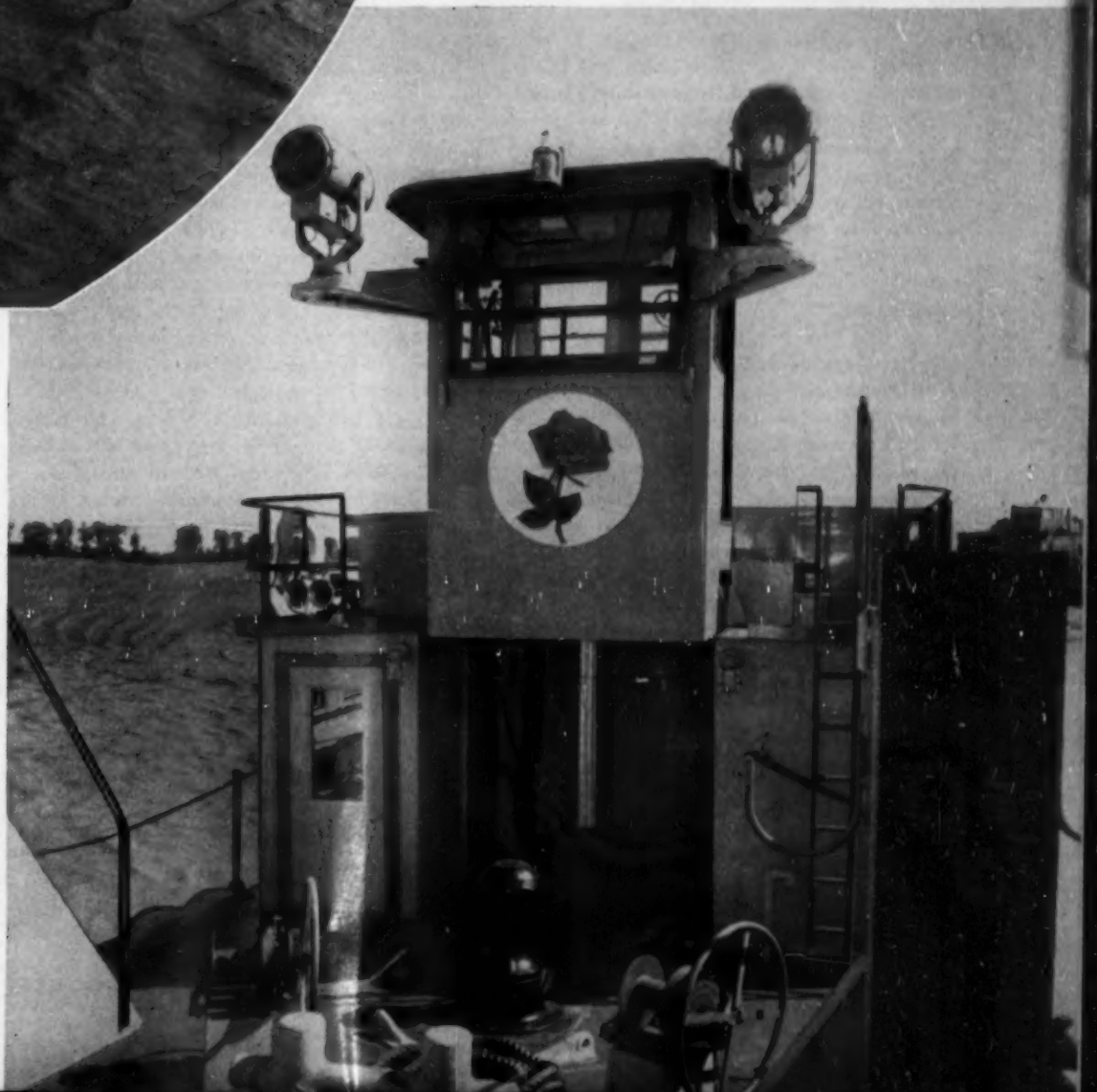
The retractable pilot house is mounted on a hydraulic cylinder having a travel of 6 ft. 8 in. In the lowered position the highest point of the pilot house is 13 ft. above the water line. The boat has a Kahlenberg 6 in. duplex air horn mounted on the pilot house. The galley is equipped with a 10½ cubic foot gas refrigerator and a gas range.

The *Barry Dean* is an outstanding example of rugged serviceable design in the field of small tow-boats. The distinctive rose-colored boat should give many years of dependable service to the Rose Barge Line.

Barry Dean with pilot house in lowered position.

View of forward deck of *Barry Dean* showing the Rose Barge Line insignia on the front of the pilot house when in raised position.

Upper engine room showing Caterpillar D-397 engine. Pair of Burgess-Manning snubbers, top left.



MORE ON FOLSOM DAM

Diesel Dump Trucks and Shovels Insure Fast Work Cycles and Dependable Service in The Construction of This Link in The California Central Valley Project

By BRUCE WADMAN

CONSTRUCTION of the Folsom Dam Project, which was introduced to the reader in the June 1952 issue of DIESEL PROGRESS, has been coming along fine despite problems and unfavorable circumstances brought about by the physical structure of the land in the main dam-site area. The contractors have been fortunate in that the rainy season, which usually begins sometime in November, has been delayed, leaving November a virtually dry month and thus keeping work schedules up to par. It was expected that the American River would exceed its diversion capacity any time after November 1st and flood the "hole" enough to limit excavation, but by the end of that month the river was still being sufficiently checked by the diversion tunnel and the cofferdams to keep the main dam-site relatively dry and workable. The foundation and flip bucket area in the main dam-site has been the scene of the most important work this season. By October, rock and earth had been removed to a net depth of 60 ft., and the removal of gravel, which is the biggest single item in excavating in the American River Channel, totaled 350,000 cu. yd. However, including the work done in November, there still remains almost 2,000,000 cu. yd. of gravel to be removed under the prime contract for the dam and the tail-race channel excavation. The enormous amount of material still to be removed is an indication of the great size of this project, which is scheduled for completion in January 1955.

Merritt, Chapman, and Scott of New York and Savin Construction Co. of East Hartford, Conn., have undertaken this \$30,000,000 construction job for the U. S. Army Engineers and Guy F. Atkinson Co. of South San Francisco has been at work on the excavation of the tail-race channel for the power plant under a \$1,500,000 contract from the Bureau of Reclamation. The 7,000 ft. tail-race channel roughly follows the present American River channel and will carry off water from the power plant turbines. Construction of this channel has been made necessary because the power plant is being built beneath the present ground level of the river channel.

On this excavation phase of the construction of Folsom Dam, the contractors have wisely equipped themselves with dieselized dump trucks and shovels to insure the maximum of efficiency and reliability in meeting work schedules on time. One of the most important factors in completing a vast construction job of this type, with a nice tidy mar-

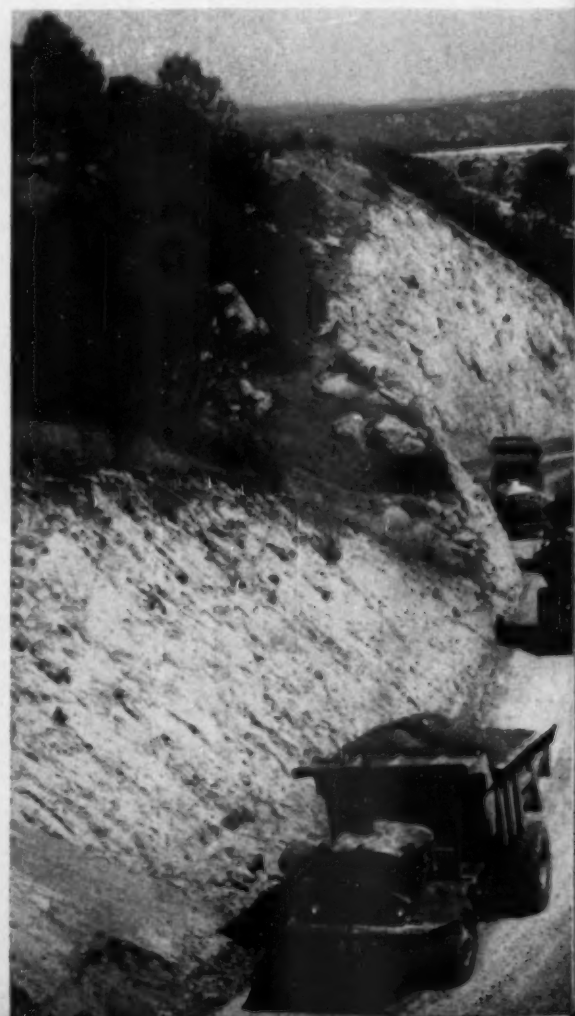
gin of profit for the contractor, is the maintaining of fast work cycles. A shovel or dragline and a team of dump trucks is the main unit that actuates a work cycle. Shovels and draglines, eating away earth, rock, and gravel from the American River bottom, feed teams of rear and bottom-dump Euclid trucks. These rugged trucks, all equipped with 300-hp. Cummins diesels, back up to the shovel and receive a hefty 22-ton load; then with all possible haste climb out of the "hole" and race to a specified dumping area. The work cycle is completed when the trucks return to the dam-site for another load. It is easy to see that if the cycle is interrupted by a breakdown in the equipment, especially in the case of a shovel, the whole team may be disrupted with a resulting loss in man and equipment hours and a chopping off of some of the profit margin. During the past season, these teams have suffered a minimum of time loss for breakdowns and repairs, while being subjected to rugged conditions in the job of clearing the dam-site and tail-race channel.

Savin Construction Co. has been operating a Manitowoc Speedcrane at the main dam-site. This huge dragline shovel, powered by a 550-hp. Cummins diesel and Twin Disc torque converter, throws out a 5 cu. yd. bucket with its 120 ft. boom and scoops the bucket in along the ground, filling it with earth and rock to be lifted and dumped into the waiting Euclids. At last count Savin had seventeen bottom-dump and fourteen rear-dump trucks on the job. In the tail-race channel, Atkinson has been using a 88-B Bucyrus-Erie dipper shovel driven by a 295-hp. Cummins diesel. The shovel, with its 4 cu. yd. capacity dipper, works feverishly loading twelve Euclid rear-dumps presently on the job. A high proportion of the excavation involved in the tail-race channel has been in solid rock. Many of the rocks must be "shot" and rebroken before they can be loaded into the trucks. It is a sight to watch this shovel in action, muscling cumbersome rocks with the greatest of ease into the dump trucks.

The combination of the refusal of the Folsom Dam builders to be kayed by structural problems of the area and the fortunate delay of adverse weather conditions has caused the construction of the dam and tail-race channel to proceed on a good schedule. When finished, Folsom Dam will add 162,000 kilowatts of hydro-electric generating capacity to the Central Valley Project and will help to increase the wealth and productivity of one of the richest vegetable and fruit growing centers in the world.



Bucyrus-Erie model 88B with 295 hp. Cummins diesel belonging to Guy F. Atkinson Co., South San Francisco, working on tail race channel below Folsom Dam.



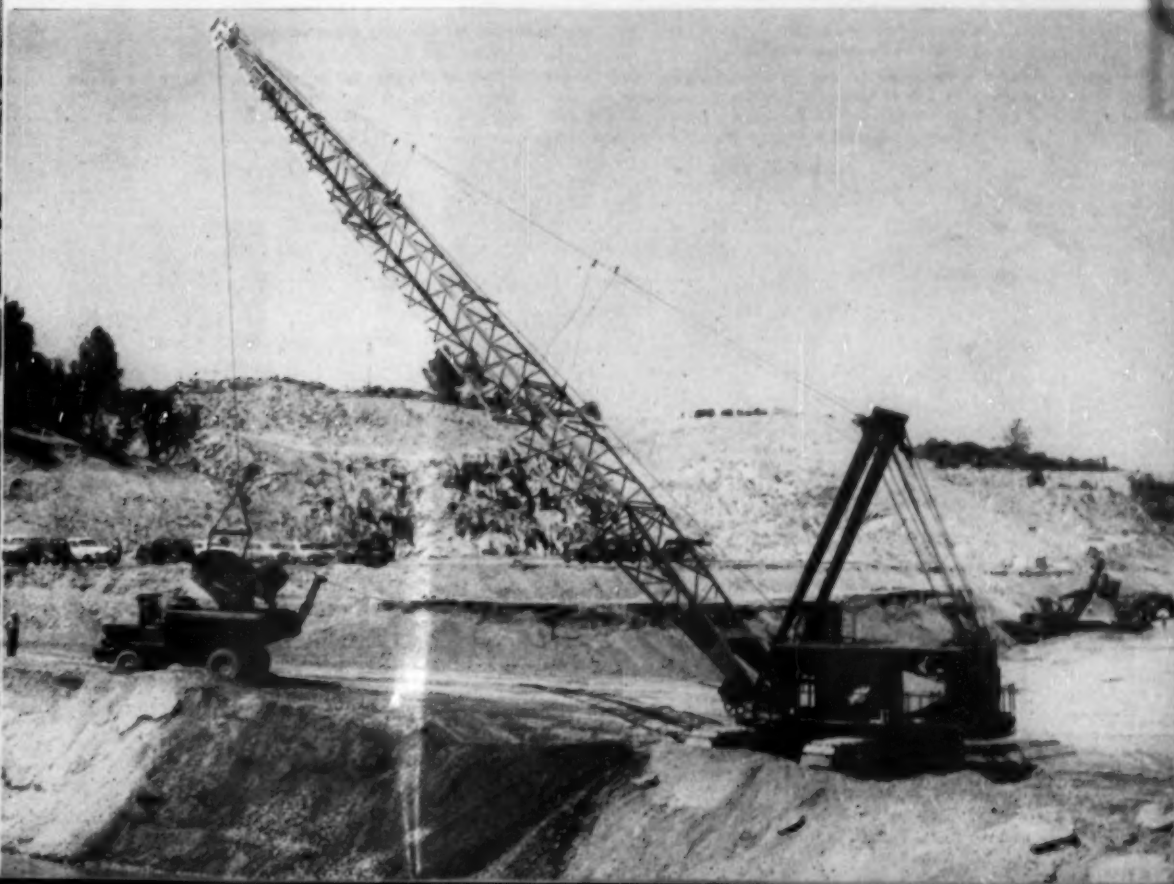


Some of Guy Atkinson's Euclids coming out of the "hole" at Folsom Dam. These Euclids average 22-ton loads, have 300 hp. Cummins diesels.



Manitowoc Speedcrane with 500 hp. Cummins diesel with Twin Disc torque converter working on Folsom Dam; 120 ft. boom on crane, 5-yard bucket. Owned by Savin Construction Corp., the Euclid rear-dump is one of 14 units with 300 hp. Cummins diesels presently on the job.

Another Savin Euclid rear-dump truck being loaded at Folsom Dam. These Euclids—both bottom and rear-dump—all have 300 hp. Cummins diesels. Savin has been adding to this fleet, by last count 17 bottom, 14 rear-dump, 2 Sterling transport trucks with 150 hp. Cummins.



TURBO-CHARGING OF DIESEL ENGINES

By GUSTI BAUMANN*

THERE are two main reasons for the fast development of supercharging engines, particularly diesel engines. For a particular class of engine (application, speed range) the price of the engine is roughly controlled by its weight if design, manufacturing and the facilities of the shops are on similar standards. The minimum air fuel ratio is more or less fixed, therefore the available output is proportional to the amount of air participating in the process. To reach low prices per hp. the ratio of air weight to weight of material must be increased without choosing too exclusive a design and manufacturing principles. More air per lb. of engine means more air per cylinder volume. This can be reached by increasing the air density by means of supercharging.

The perfect expansion engine should work from the highest permissible pressures limited by the mechanical stresses down to the ambient conditions. High pressures mean small gas volume and for this range a piston engine is the proper machine. On the lower end of the expansion process the gas volume becomes large and here the turbo machine is in its proper place: small pressure ratios, large volumes. Creation and perfection are the engineer's intention so why not combine these two types of machinery into one power unit? This means following the physical laws better with our equipment. Nowadays a creation is possible and

"Editor's Note: The author spent several months during 1952 in the United States as an application engineer for Brown Boveri Corporation. In this article he discusses the basic reasons for, and principles of, turbo-charging, also recent turbocharger developments that greatly extend the power range in which these machines are applicable. The unit described here is produced in eight sizes for low-pressure (compression ratio 1.5:1) supercharging with maximum turbine inlet temperature of 550 degrees C for continuous and 600 degrees C for intermittent service. Also seven sizes for high-pressure (compression ratio 2.2:1) with permissible inlet temperature of 600 degrees C for continuous and 650 degrees C for intermittent service. These units are available for supercharging 4-cycle diesel engines having boosted ratings from 150 to 5500 hp. Mr. Baumann closes his article with some interesting observations on turbo-charging of gasoline engines."

has met with success if it is both commercial and has human intention of perfection.

To realize these ideas Brown Boveri Ltd. in Switzerland started to study this combination of machinery back in 1922. Some realizations of that work are: (1) The gas turbines of today where the engine cylinder is replaced by a low pressure steady flow combustion chamber and the gas turbine is the power unit. (2) Turbocharging of diesel engines where the gas turbine is only an auxiliary and the

combustion chamber becomes the power unit. (3) Velox steam boilers where the cooling water jacket of the combustion chamber is the important part to produce steam. The low pressure steady flow combustion chamber is used as heat source, the exhaust gas turbine drives a compressor which feeds the boiler with air of higher pressures than ambient. Result: a compact boiler, better heat transfer coefficient due to greater density, more air and steam per lb. of boiler.

More than twenty years ago Brown Boveri started to produce exhaust gas driven turbo chargers. Based on approximately fifteen years of experience in service, maintenance and performance a new series of turbochargers were designed and built in 1944. Today Brown Boveri turbochargers are available for 150 up to 5500 hp. supercharged output. They are used in all fields, traction, ship propulsion, stationary power plants, and high altitudes of installation.

A large number of identical diesel engines is seldom required for the same application, except where low-power traction engines are concerned. On the other hand, a number of partially or even completely different turbo-chargers must be available for a given type of engine if its use is not to be restricted. Special designs in small batches are normally not economical and must be tested very thoroughly each time. Brown Boveri found an early solution to this problem by assembling turbochargers from standard parts built on the unit construction principle and which could be applied to a very wide range. The most suitable casings, wheels, and nozzle rings and diffusers for the case in question are selected and the casings so bolted together that the connecting branches point in the required direction. This type of assembly has proved very satisfactory in practice.

The new range of turbo-chargers, comprising seven different sizes, is designated VTR. The different sizes of compressor and turbine can cover practically the entire range of operating requirements for two and four-stroke engines with a satisfactory efficiency. In view of the multifarious operating requirements which these machines had to meet it was hardly expected that no initial difficulties would be encountered. Such difficulties as did occur were, however, overcome.

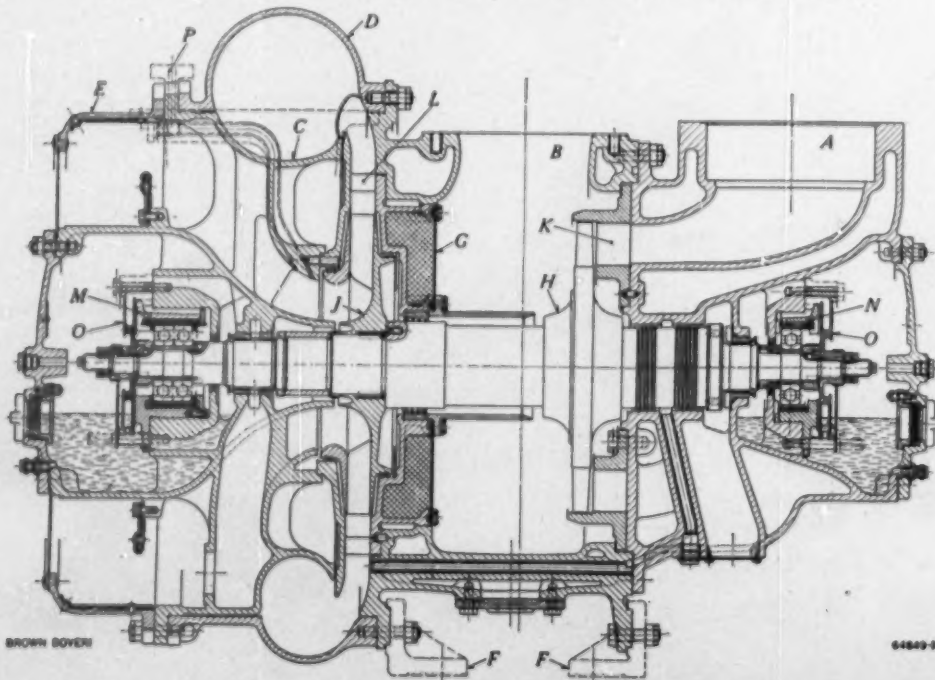
In evolving the new range the following principles, among others, were taken as base: Everything that had proved satisfactory in the earlier types was to be retained and everything else omitted. Every effort was to be made to simplify maintenance; All requests, with regard to the method of fitting on the engine, were to be considered and included, as long as they did not jeopardize economy.

The design of the new turbo-chargers is in principle the same as hitherto and substantially the same for all sizes. New parts which have been added

Section through an exhaust-gas turbo-charger type VTR 320

- | | |
|-------------------------------------|--|
| A = Gas inlet casing, water cooled | J = Blower wheel |
| B = Gas outlet casing, water cooled | K = Nozzle ring |
| C = Inner blower casing | L = Diffuser |
| D = Outer blower casing | M = Bearing assembly, journal and thrust bearing |
| E = Suction and silencer hood | N = Bearing assembly, journal bearing |
| F = Feet for fixing | O = Lubricating disc |
| G = Heat insulating barrier | P = Connection for deaerating engine crank-case |
| H = Shaft with turbine wheel | |

The drawing shows a turbo-charger for low pressure operation with a compression ratio up to 1.5 on the air side. For the high-pressure type with pressure ratios up to 2.2 an open-sided centrifugal compressor and shorter turbine blades are used instead of those shown here. The external dimensions of the charger and the connections are the same in each case. The maximum allowable temperature for the first case is 550°C continuously and 600°C for a short period, and in the second case 600°C and 650°C, respectively.



increase the pressure range and allow a low-pressure charger to be converted to a high-pressure charger. A few details are discussed hereafter.

The bearings are fitted one at each end of the rotor and are therefore easily accessible. They are fitted in damping elements which prevent damage to the bearings due to vibration of the shaft and shocks of all kinds. The lubrication of the bearings is independent of that of the engine. Lubricating discs fitted one on each end of the shaft supply oil to the bearings—for large machines pumps are used instead of discs. The bearing casing acts as an oil tank and is completely sealed, except for the shaft bore. On the compressor side, the lubricant is cooled by air flowing over the bearing casing and, on the turbine side, by the water in a jacket around the casing. Cooling coils or oil pipes, easily damaged by shocks, are dispensed with.

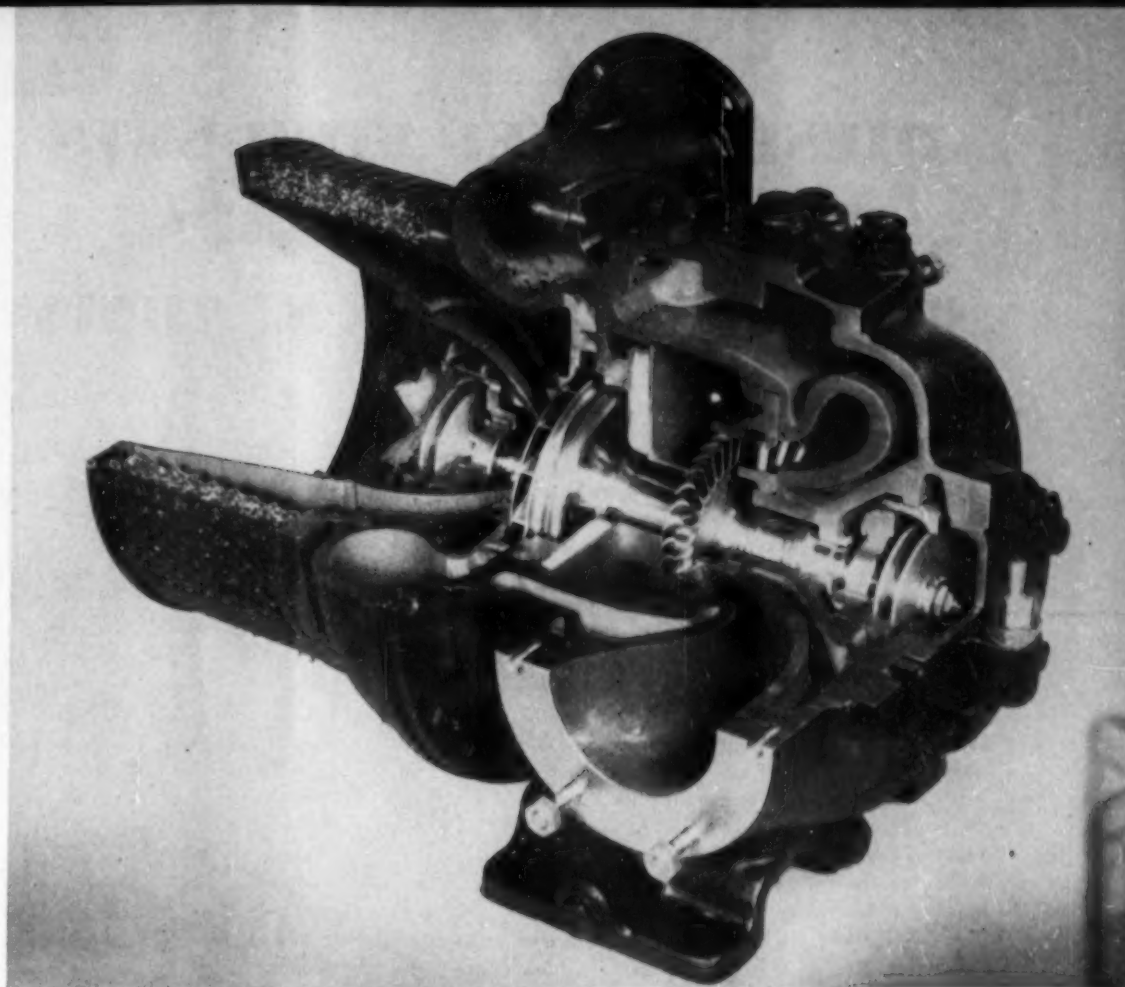
The assembly and dismantling of the turbo-charger is simple. To dismantle, the lubricating discs and bearing assemblies are removed, then the inner blower casing extracted, whereupon the complete rotor, together with the heat-insulating barrier, can be removed. Special devices and tools supplied with the turbo-chargers facilitate this work and prevent damage to the glands. It should be noted that neither gas, charging air, nor cooling water connections need to be disconnected, except in the case of small chargers where the charging air pipe must be disconnected as the compressor casing is in one piece.

To deaerate the engine crankcase there is a connection on the charger leading to a point, before the compressor impeller, where the greatest vacuum prevails. Many designers use this vacuum to extract the gases which leak into the crankcase between the piston and walls of the cylinders. This prevents oil vapour escaping into the engine room with the gas. It has been a matter of great controversy whether this extraction increases or not the risk of an explosion, as, with the crankcase under vacuum, air can leak in and form an explosive mixture with the oil vapour. If the connection is used, a good oil separator must always be fitted in the pipe since oil vapour would mix with soot in the charger and cause deposits to form in it.

In the near future the following fields will prove interesting: (1) Special design of engines suitable for high pressure supercharging. (2) Further increase of BMEP by means of special supercharging systems (Miller system, turbocooling system, etc.). (3) Supercharging of two cycle engines.

On gasoline engines mostly mechanical driven superchargers are used for the reasons that follow.

1. Exhaust gas temperatures are very high for the available materials used on gas turbines. In a diesel engine the gas temperature always can be reduced by introduction or increasing the amount of scavenging air or increasing the air excess for combustion. Scavenging in a gasoline engine means bad fuel consumption (except for an injection type engine) and danger of explosions. The air excess for combustion can only be varied in a small range for a gasoline engine.



Cutaway view of the Brown Boveri VTR 220 turbo-charger.

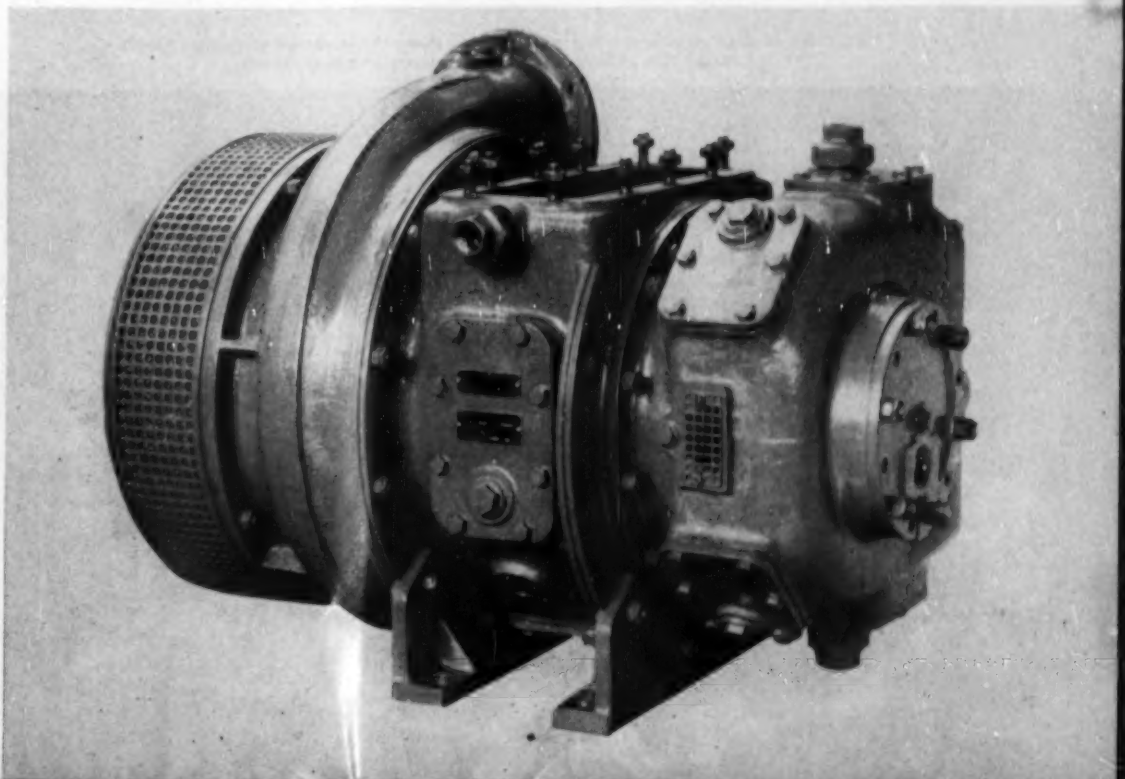
2. If the carburetor is mounted before the blower a flammable mixture is compressed. Hot gases from the turbine might flow to the blower side or a part of the air/gasoline mixture could reach the gas turbine. Therefore explosions might occur or specially designed turbochargers must be used (more expensive and more complicated). If the carburetor is mounted after the blower discharge then the carburetor works at different pressure depending on the load of the engine.

The gasoline injection engine would be very suit-

able for supercharging by means of an exhaust gas driven turbocharger. For some special applications such as airplane engines this type of turbocharger has been used.

Supercharging of diesel and gas engines is well established today and has already proven its advantages many times even for the low pressure system where the gain by using this system is not as pronounced as for high pressure supercharging, turbocharging in high altitudes and some special applications.

Brown Boveri Model VTR 220 standardized turbo-charger.



DIESEL GENERATOR SETS TESTED FOR CORPS OF ENGINEERS, U. S. ARMY

THE Corps of Engineers, U. S. Army, has contracted with Sterling Engine Company to supply a number of diesel-generator sets having characteristics that will satisfy many out-of-ordinary operating conditions. These units are rated for continuous duty at 500 kw. and are in the category of high-speed, light-weight design. The entire unit is readily portable. It may be transported on a truck and loading and unloading are easily accomplished with ordinary skids and rollers. Since the engine is designed to operate in ambient temperatures ranging from 32°F. to 125°F. and no overhead lifting equipment is required for servicing the engine, it does not need special housing facilities. It is assumed that in some localities, these generating plants will be operated virtually in the open. Only foundation required is a concrete mat, 6 in. or 8 in. thick. All of the electrical equipment is specially designed to provide for radio suppression and fungus proofing.

The engines used to power these generating units embody the newest design features of the Sterling model VDS-8S. General specifications are: Type of engine 4 cycle, inline, exhaust turbine supercharged, 750 hp. at 900 rpm., 1500 hp. at 1800 rpm., 8 cylinder, 8 in. x 9 in., 3,619 cu. in. displacement, weight 11,900 lbs., dimensions—134½ in. long, 39¼ in. wide, 64 in. high, 1200 rpm. for 60 cycle, 1000 rpm. for 50 cycle, with a power output of 500 kw.

Although in the category of high-speed, light-weight designs, the tests to which these power plants were subjected indicated that they will operate on continuous duty with long life and dependability.

They deliver power with a smooth "flowing" effect that is free from the rhythmic pulsing and stressing sometimes inherent in other types.

A requirement of this contract was that the engines undergo a 100-hour continuous test run. This test, recently completed, shows an average fuel rate of .358 lbs./bhp. hr. The ambient temperature during the run was in the neighborhood of 116° F. and the barometer was approximately 29.4. The full load fuel rate was .357 lbs./bhp. hr. The ¾ load fuel rate was .359 lbs./bhp. hr. and the ½ load fuel rate was .379 lbs. /bhp. hr. The results of the official fuel tests are shown in Table I.

Among the features which render this engine suitable for service in remote places is the excellent accessibility of all parts requiring service or maintenance. For example, it is possible for one man to remove any one complete cylinder head, piston and connecting rod assembly in 30 minutes. After the cylinder head and piston are removed, a liner can be removed in less than 5 minutes additional time. One man can install a new liner, new piston and rod assembly and cylinder head complete in approximately 45 minutes. Every bearing of this engine is readily accessible through adequate hand-hole and inspection covers and can be quickly removed or replaced. Injection pumps, injection nozzles, lubricating oil pumps, water pumps and other accessories are easily removable. All parts are manufactured to precision standards and are interchangeable. There is a minimum of piping required on this unit, as the engine has its own lubricating oil sump tank. The only piping connections required on the installation are interconnecting

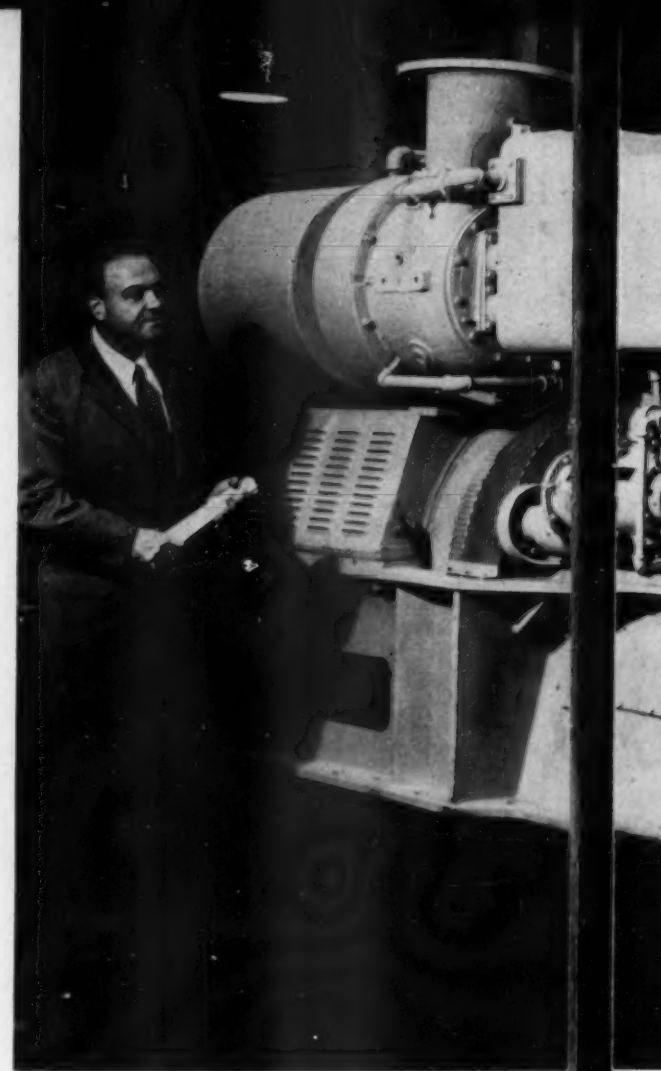
water and oil pipes between the radiator and engine. These connections are made extremely simple by hose connections for both discharge and inlet water. The oil piping is equally simple. Dresser couplings are provided at the engine on both the discharge and inlet connections for the lubricating oil.

Oil bath air filters are provided for the inlet air to the turbocharger. Exhaust silencers are provided for the exhaust. The lubricating oil system is kept clean at all times by an oil filter of liberal capacity.

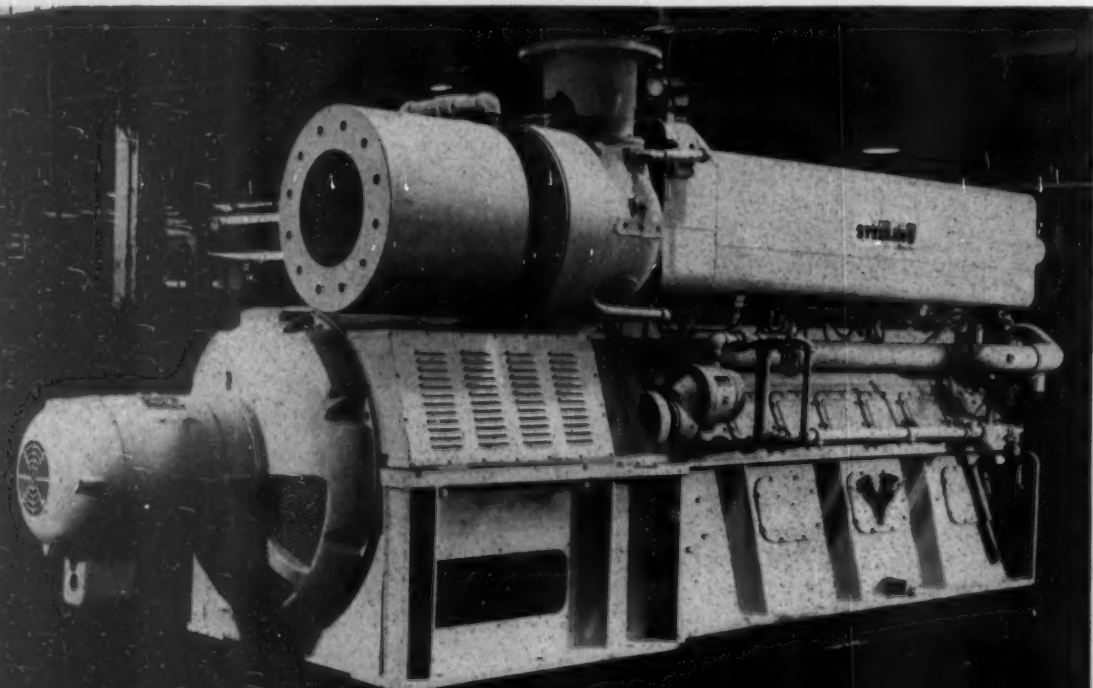
The fuel injection system is designed in such a manner that it is always provided with a flow of fuel oil through the injection header which keeps the engine primed at all times and removes any possibility of the fuel injection jerk pumps becoming air bound. This assures ease of starting at all times, even at low ambient temperatures.

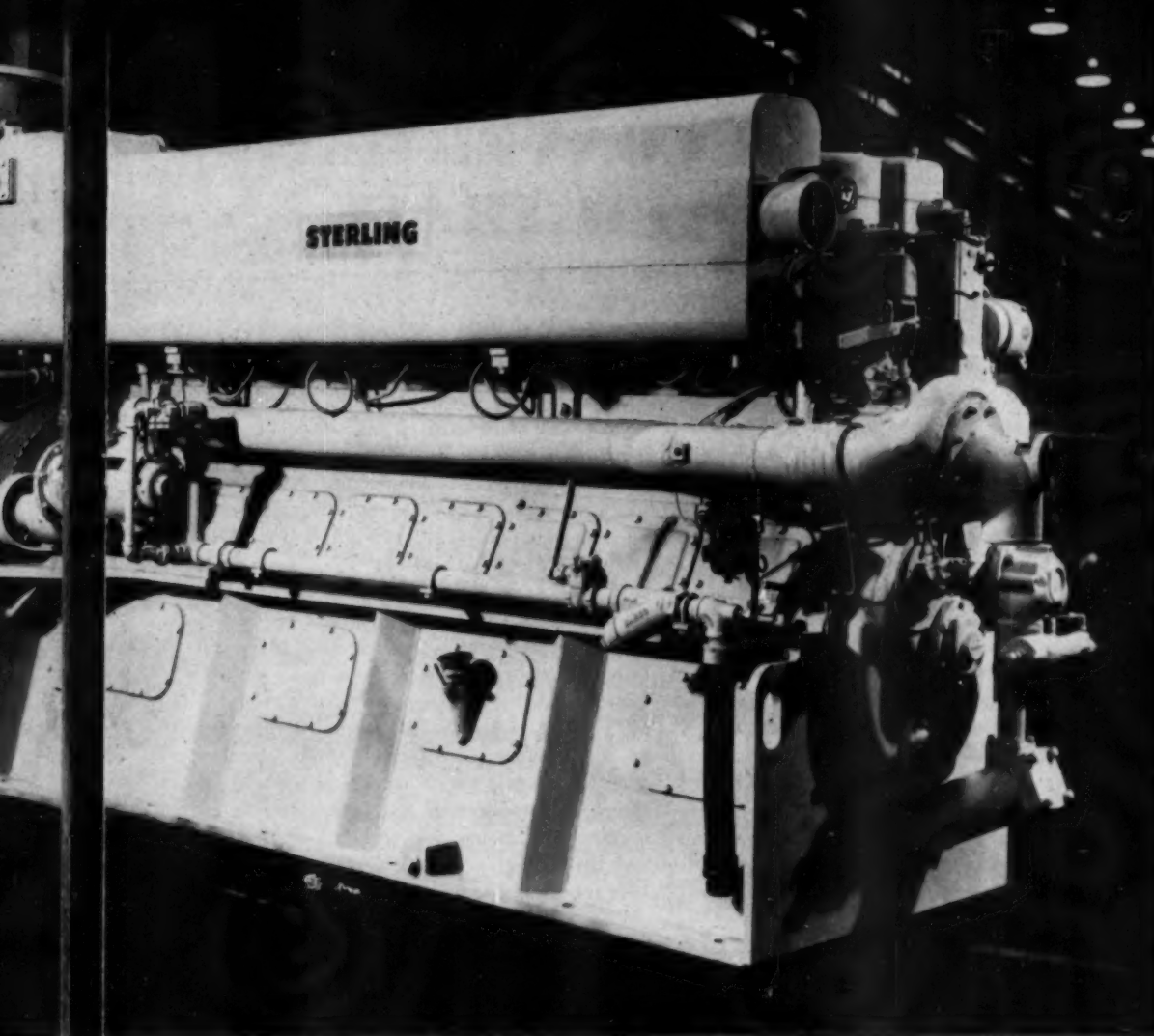
The generator portion of these sets is designed and manufactured specifically to meet the specifications which require it to generate at 2400 volts or 4160 volts, 3 phase, 4 wire convertible to 2400 volts, 3 phase, 3 wire at 60 cycle or 50 cycle. In addition, the generators are required to have radio suppression. They are of the single bearing type with direct driven exciter and are mounted on the same base as the engine.

The switchgear is of a new and revolutionary design. There are actually 6 panels built into one and this panel is capable of handling 2400 volts 4160 volts, wye or delta connected at 60 cycle or



This view of the 8 cylinder Sterling model VDS-8S shows the Marathon generator, Air-Maze intake filter, Elliott turbocharger, Ingersoll-Rand air starter.





Sterling President, Robert Russell, standing beside the new Sterling diesel which has recently successfully passed acceptance tests by the Corps of Engineers, U. S. Army.

50 cycle. These panels contain appropriate meters for all phases of operation including parallel operation. It further conforms with many safety requirements and fungus proofing.

The cooling system is capable of dissipating 2,250,000 btu.'s per hour. Radiators are vertically mounted and have separate cores for oil and water. Air flows first through the oil radiator and then through the water radiator section. The cores for the water radiator consist of $\frac{3}{4}$ in. O.D. copper tubes, .035 in. wall thickness with aluminum fins .013 in. thick capable of operating under working pressure of 100 psi. and test pressure of 200 psi. The oil cores consist of $\frac{3}{4}$ in. O.D. copper tubing, .035 in. wall thickness with aluminum fins .013 in. thick capable of operating with a working pressure of 100 psi. and a test pressure of 200 psi. The temperature is automatically controlled by shutters and the radiator fan is electric motor driven. Extremely close regulation of temperature is obtained by a combination of control of the electric motor driven fan and the modulated motor control of the radiator shutters. This type of cooling is economical because practically no make-up water is required for normal operation. During the entire 100 hour continuous run and on preliminary tests of this cooling system in the Sterling Engine plant, the water temperature never varied more than 4°F.

All engine gages are mounted on a specially constructed gage panel which was designed to match the electrical panel. All necessary instruments for

observing the performance of the engine are included on these panels. They include pressure gages, thermometers for water in and out, and oil in and out, pyrometers with selector switch for observing the exhaust temperatures in each cylinder and in the outlet from the engine, a manometer for the intake air pressure and an annunciator to indicate the shutdown device which may be in operation. These units are protected against high water temperature, low lube oil pressure and overspeeding. Extensive tests were conducted in accordance with the Corps of Engineers, U. S. Army speci-

cation at the Sterling Engine Company plant. These tests include a 125°F. ambient temperature heat run and a 32°F. ambient temperature starting test and run, torsigraph tests, regulation and governor stability, parallel operation, and 100 hour continuous operation test. The special electrical tests on generators were regulation, phase rotation, phase balance, circulating current, rheostat range, regulator range, droop curves, stability, insulation resistance, high potential and radio suppression. The sets proved their ability to perform under the conditions set down in appropriate specification. After completion of all the test runs, the engine was completely dismantled. Photographs were taken of all parts subject to wear and careful inspection was made of bearings, pistons, rings, valves, springs, and so forth. In addition to this, the parts subject to wear were carefully micrometered by inspectors of the Sterling Engine Company in the presence of the U. S. Engineers' inspectors. No measurable wear could be detected on any of the engine parts.

List of Equipment

Air Filter-Silencers—Air-Maze.
Air Starters—Ingersoll-Rand.
Aluminum Castings, pistons, valve gear covers, etc.—Aluminum Co.
Bearings—Cleveland Graphite Bronze.
Crankshafts—Ohio Crankshaft.
Cylinder Block Castings—Pohlman Foundry.
Cylinder Liners—Campbell Wyant & Cannon.
Exhaust Silencers—Maxim Silencer.
Engine Valves (Intake and Exhaust)—Thompson.
Fuel Injection—American Bosch.
Fuel Oil Filters—Cuno.
Fuel Transfer Pump—Barnes.
Gages—U. S. Gage.
Governors (Speed Regulation)—Woodward.
Governors (Overspeed)—Synchro-Start.
Generators—Marathon Electric.
Lube Oil Filters—Briggs.
Lube Oil Strainers—Cuno.
Lube Pump—Gerotter May.
Piston Rings—American Hammered.
Pyrometers—Alnor.
Radiators (Water and Oil Cooling)—Young.
Turbochargers—Elliott.
Valve Lifters (Zero Lash)—Eaton.

TABLE I

Load	KW	Baro. Press.	Air Temp °F.	Fuel Lbs/Hr	Fuel Rate Lbs Kw/Hr	Corrected* Fuel Rate Lbs/Kw/Hr	Lbs Bhp/Hr
1200 R.P.M. OPERATION							
Full	500	29.51	100	270	.54	.514	.357
$\frac{3}{4}$	375	29.51	105	205	.546	.517	.359
$\frac{1}{2}$	250	29.51	103	144	.576	.546	.379
$\frac{1}{4}$	125	29.50	101	92	.735	.703	.487
No Load	0	29.50	98	30
1000 R.P.M. OPERATION							
Full	425	29.43	106	238	.559	.528	.367
$\frac{3}{4}$	318	29.44	102	173	.544	.515	.358
$\frac{1}{2}$	212	29.45	100	123	.58	.55	.382
$\frac{1}{4}$	106	29.45	100	75	.707	.670	.465
No Load	0	29.42	94	21
500 R.P.M. OPERATION							
Idle	0	29.42	100	7

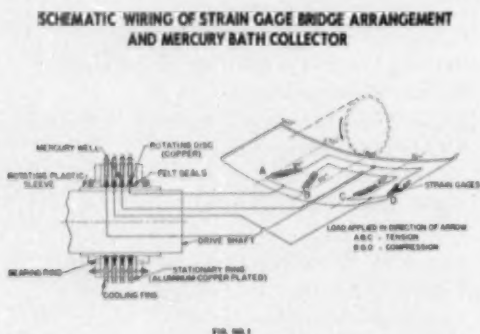
*Corrected to standard barometer and temperature.

THE HYDRAULIC TORQUE CONVERTER- ITS EFFECT ON THE POWER TRAIN

By R. M. SCHAEFER and J. A. WINTER*

FROM the outset of the use of the hydraulic torque converter in excavators, tractors, earth-moving machinery and off-highway trucks, it was generally conceded that the converter would help start heavy loads smoothly, reduce shock and torsional loads, and eliminate stalled and lugging engines due to overloads. This understanding and reduction of operator effort led to the wide acceptance of the converter drive by the earthmoving industry, and ore and coal mine operators in every part of the country. At the same time it was indicated that the converter drive was contributing directly to longer engine, transmission and differential life by the elimination of shock loads which many operators claim were responsible for a great percentage of the transmission, driveline and rear axle failures.

Hand in hand with speculative converter char-



acteristics and reports of longer life for its power train components, Allison began to accumulate a wide experience in building many different models of hydraulic transmissions for both commercial and military applications. After one of the first hydraulic torque converter transmissions had been in service for several years with good results, it was felt that the capacity of this transmission could be increased. The present rating permits its use in connection with 50% larger engines without experiencing any difficulties such as shorter life and increased failures due to excessive stresses. This experience indicated that the normal load and stresses on the parts of hydraulic transmissions could be increased over the values previously used due to the use of the converter in the power train. Even with operator's records indicating a trend towards longer life of power train components when using a torque converter, and our design and field experience in hydraulic transmissions, there was still felt by everybody directly concerned with the use of transmissions, the need for actual data relating to the characteristics of torque converter operation.

*Transmission Engineering, Allison Division, General Motors Corporation. As presented at the SAE National Tractor Meeting, Milwaukee, Wisconsin, September 9-11, 1952.

With this interest established as a subject for the 1952 SAE National Tractor Meeting in Milwaukee, the impetus necessary was provided to develop and carry through a series of actual field tests. In consideration of the accessibility of the transmission and the entire power train, it was decided to conduct this test program on off-highway trucks used in the earthmoving, coal and ore hauling industry. In order to accumulate the information desired, several operators and users of this equipment co-operated very generously. They agreed to make their equipment available in order to measure driveline stresses in the power train on identical trucks using both mechanical and converter drives operating over similar haul roads. Also included in the plan was an investigation into the gear stresses of various common transmissions used in off-highway trucks and a comparison of the design stresses with those to be obtained from the

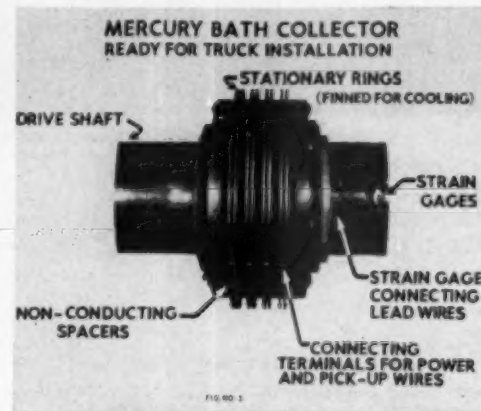


field tests later on. In addition to measuring the drivelines stresses and comparing them to design specifications, operators further co-operated by making their operating records available on the maintenance of the power train components in both mechanical and converter equipped trucks they had operating long periods of time.

Test Equipment Used

A method for determining power and torque distribution in mechanical and torque converter power trains used in off-highway trucks under field conditions was needed, which could be used without making changes in the original power train components thus changing their characteristics. The ordinary slip ring type collector had many undesirable characteristics and the mercury bath collector was, therefore, selected. With this in mind, it was decided to use Professor D. E. Burroughs, Purdue University, mercury-bath commutator in combination with strain gages and suitable amplifying and recording instruments. Professor Burroughs' method allows the original drivelines to be used without change except the addition of strain gages and the mercury-bath com-

mutator. For our use it was necessary to design, develop and build our own commutator, because the Burroughs' commutator was only 1½ inches in diameter and end mounted on shaft. Shafts which were to be used in the equipment indicated above were 3½, 4, and 4½ inches in diameter and naturally the pickup would have to be large enough to fit these shafts. When the first commutators, built for this program, were tested they would not stand up because of high temperature problems resulting from the spinning of large discs in mercury. So it was necessary to redesign the original pick-up to incorporate cooling fins on the stationary ring to help reduce the temperatures when in operation. Also, a new kind of high temperature cement had to be found for assembling the commutator parts together. Along with the high temperature difficulties, the commutator cells had to be sealed to prevent cross leakage

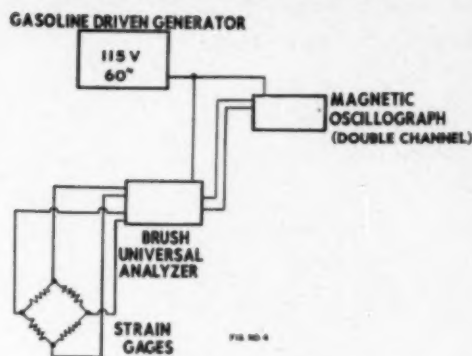


of mercury which resulted in shorting out the electric circuit. A felt seal was developed to overcome this difficulty.

Figure 1 shows a cross section of the mercury bath collector mounted on a 4 in. diameter shaft and the strain gage bridge located on the projected area of the shaft with the wiring connections to the collector.

The collector was made with four cells to accommodate the four lead wires from the bridge. Contact was made through a rotating disc and a stationary ring which were in contact with a mercury well. Plastic was used to make the non-conducting portion of the cell with copper discs and aluminum rings for the conducting elements. The aluminum rings, which were copper plated, and copper discs were amalgamated with mercury to give more stable resistance characteristics. The bridge arrangement was located to measure the compressive and tensile strains due to torsion in the shaft. The strain gages were placed on the shaft at a 45° helix with the center line of the shaft. The effect due to bending can be cancelled

SCHEMATIC WIRING DIAGRAM USED IN FIELD TEST



by using four active gages on the shaft. This type of arrangement makes the set-up four times as sensitive to torsional strain. The gages are connected to form a four arm bridge. The two gages lying on the same helix angle and displaced radially by 180° form opposite arms of the bridge.

Figure 2 shows an exploded view of the commutator parts and how they appear when assembled to the shaft. Figure 3 is a close-up of the commutator assembly ready for truck installation. A schematic wiring diagram of the truck installation appears in Figure 4. The bridge is connected through the mercury-bath commutator to an amplifier and a direct inking oscillograph. Power for operating the various instruments is obtained from a 115 volt 60 cycle gasoline driven generator which is mounted directly on the truck.

The amplifier is a self-contained Wheatstone bridge and voltage amplifier operating with 120 ohm strain gages. The output is designed to operate a penmotor and will record uniformly from dc. up to 100 cps.

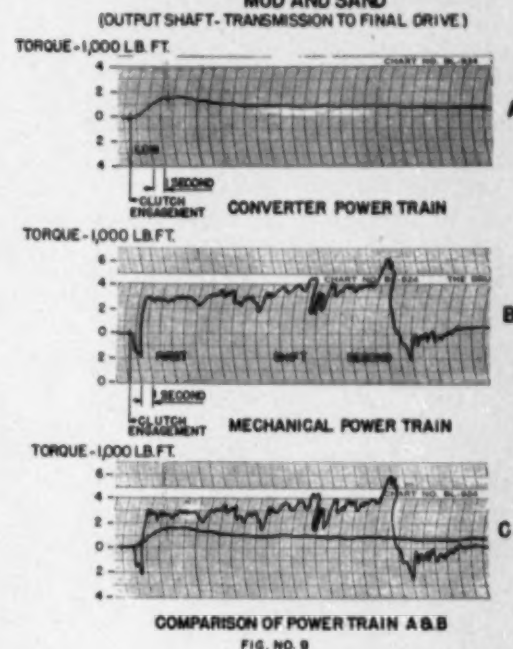
The magnetic direct inking (double channel) oscillograph permits instantaneous recording of the shaft loading in torque. The recordings are made on chart paper 3½ in. wide. A synchronous chart drive motor provides paper speeds of 5, 25, and 125 mm. per second.

Tests

Figure 8 is a reproduction of the test recordings of both the torque converter and mechanical equipped trucks as they started a regular run over the same terrain. The trucks were identical in capacity and power except for their power trains. The torque converter recording A represents the clutch engagement as the truck moves away from the shovel. The next recording B shows what happens when the mechanical unit starts away from the shovel. As a comparison, C recording is a record of the torque converter data superimposed on the mechanical data.

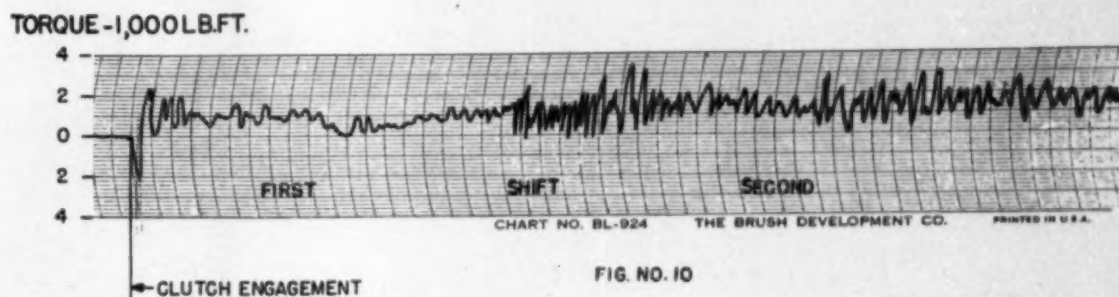
Figure 9 represents another test run of a truck equipped with mechanical unit as the driver engages its clutch to start the load moving away from the shovel. This start is in mud and sand and represents severe operating conditions for any vehicle. Figure 10 is a recording of a mechanical unit illustrating resonance during a shift from low to second gear. It also shows the stress variation in the power train as the truck moves away from the shovel to the dump.

COMPARISON OF CONVERTER AND MECHANICAL POWER TRAIN REACTIONS WHEN STARTING IN MUD AND SAND



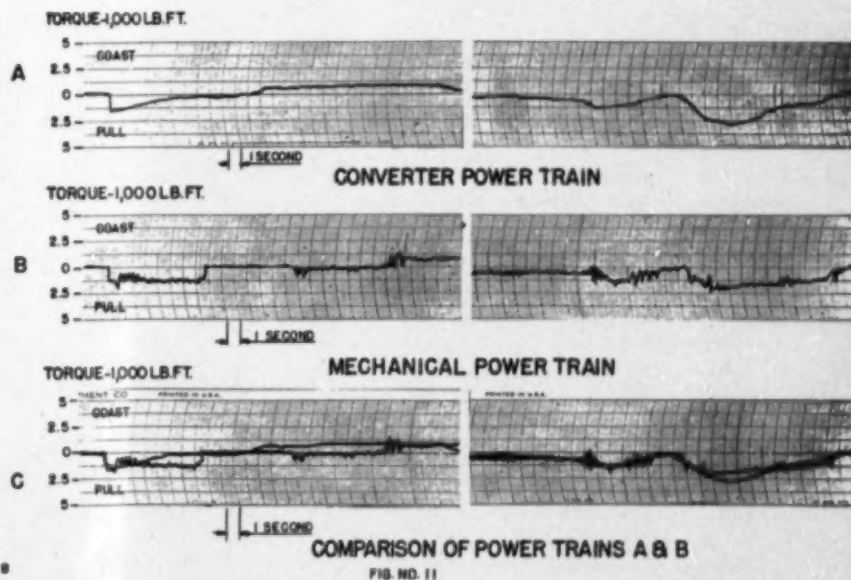
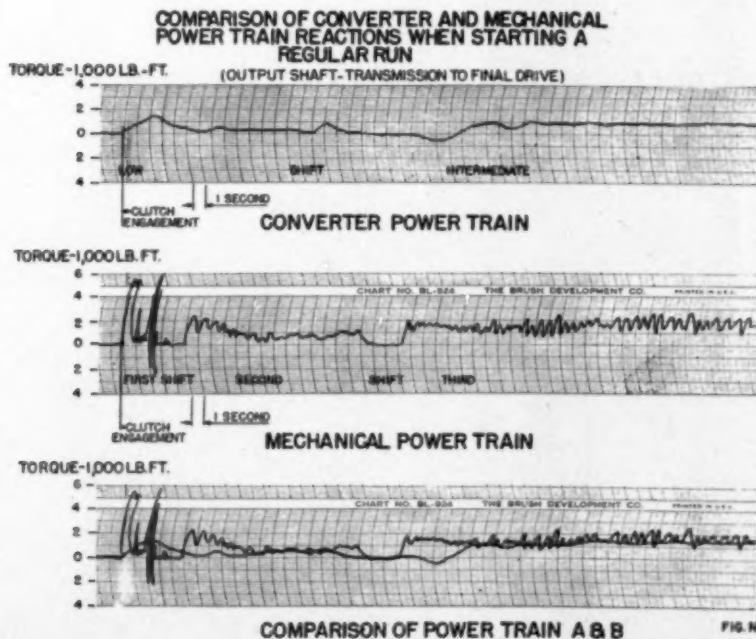
RESONANCE IN MECHANICAL POWER TRAIN WHEN SHIFTING

(OUTPUT SHAFT- TRANSMISSION TO FINAL DRIVE)



COMPARISON OF CONVERTER AND MECHANICAL POWER TRAIN REACTIONS DURING CROSS COUNTRY RUN

(OUTPUT SHAFT- TRANSMISSION TO FINAL DRIVE)



Referring to Figure 11, recording A shows the torque distribution and the characteristics of the torque converter while operating over a cross country run. Recording B which is the mechanical unit represents the torque distribution and stress variations while traveling over the same ground. Recording C is again a comparison of recording A and B. The first half of the recordings A, B and C is the beginning of the run while the last half is the finish. Load variation of a torque converter unit is demonstrated by Figure 12. Here the recordings are identified to the test run in order to illustrate how the converter torque distribution reacts to the changing terrain. These recordings show pulling, coasting and shifting as the vehicle moves along over its course.

Results of Field Tests

An examination of the tests of the mechanical and converter equipped trucks indicates that the results can be reduced to the following kinds of loads:

(1) Starting—When the conventional trucks were started with heavy loads, the clutch engagement shock load was approximately 4.28 times the converter observed starting torque in a similar power train. Figure 13A illustrates the comparison of converter and mechanical units when the clutches were engaged to start the vehicles. It was also observed that the shock loads included load reversals during the start. (2) Shifting—Figure 13B shows what happened during a quick shift after starting a heavily loaded truck equipped with a clutch and multi-speed transmission. The shock loads were approximately 4.25 times the smoothly applied torque of the converter after the shift from first to second gear. (3) Load Variation—These reactions were due to the torque variation under normal operation and shifting of the trucks. Figure 13C shows a comparison between mechanical and converter units during vehicle operation over a given haul cycle. Based on an average mean load, the mechanical unit indicated about a plus and minus 28% stress variation during its normal operating cycle while the converter unit showed a plus and minus 14% stress variation. And during average shifting operations for both units, the load variation based on average torque of the mechanical unit was approximately plus and minus 67% compared to the plus and minus 25% of converter observed load variation.

Transmission Design Stress

It has been mentioned previously that an investigation into the working stresses of various transmissions currently used in off-highway trucks was planned for the purpose of determining a relationship of design stresses between transmissions used with mechanical drives and those used with torque converters. The data used for mechanical transmissions were based on the information we could obtain in the field and unfortunately, due to lack of time, has not been correlated with their manufacturers. The relationship between the two types of transmissions is shown in Figure 14. The average design stress is represented for two types of transmissions, mechanical and hydraulic. The hydraulic design stress is slightly higher than me-

TORQUE DISTRIBUTION OF CONVERTER EQUIPPED TRUCK OPERATING OVER CHANGING TERRAIN OUTPUT SHAFT-TRANSMISSION TO FINAL DRIVE

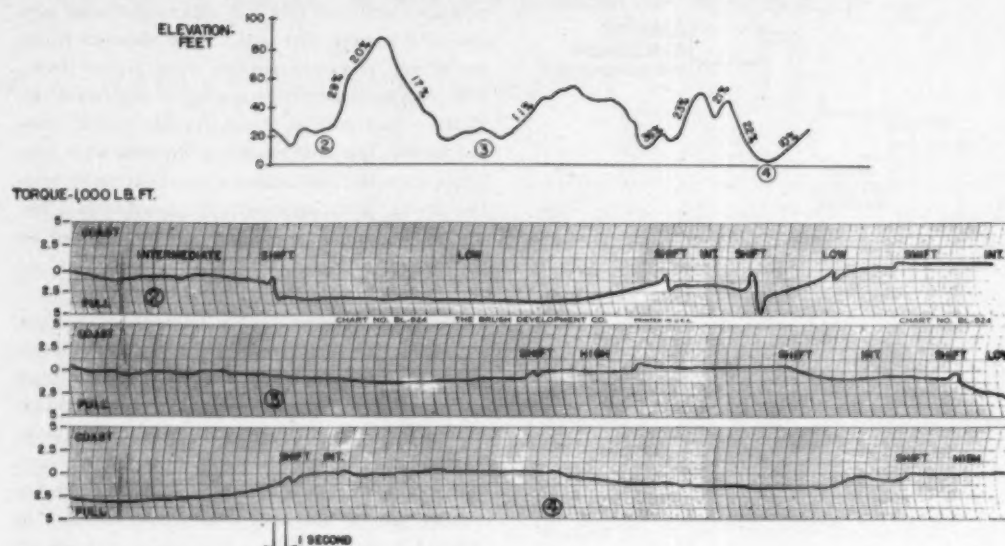


FIG. No. 12 A

TORQUE DISTRIBUTION OF CONVERTER EQUIPPED TRUCK OPERATING OVER CHANGING TERRAIN OUTPUT SHAFT-TRANSMISSION TO FINAL DRIVE

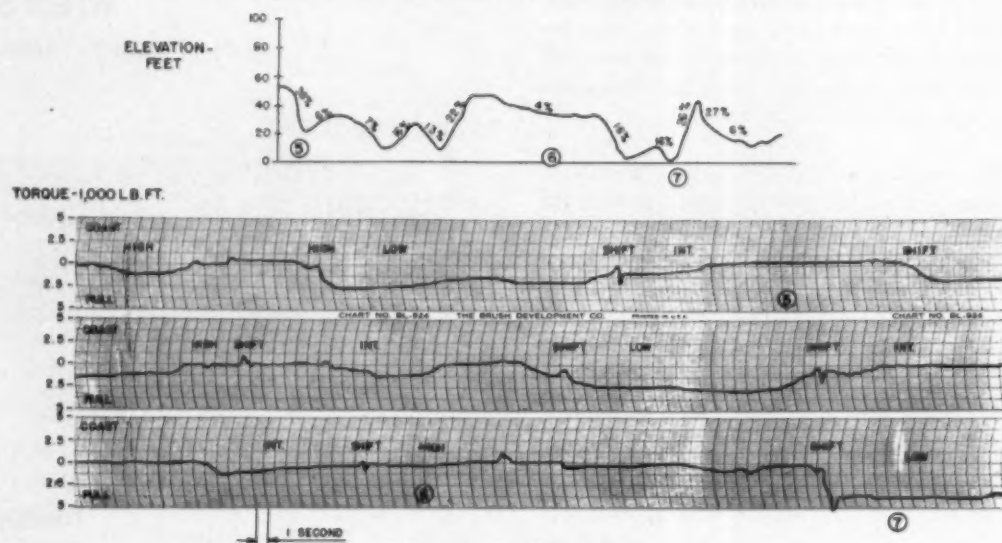


FIG. No. 12 B

TORQUE DISTRIBUTION OF CONVERTER EQUIPPED TRUCK OPERATING OVER CHANGING TERRAIN OUTPUT SHAFT-TRANSMISSION TO FINAL DRIVE

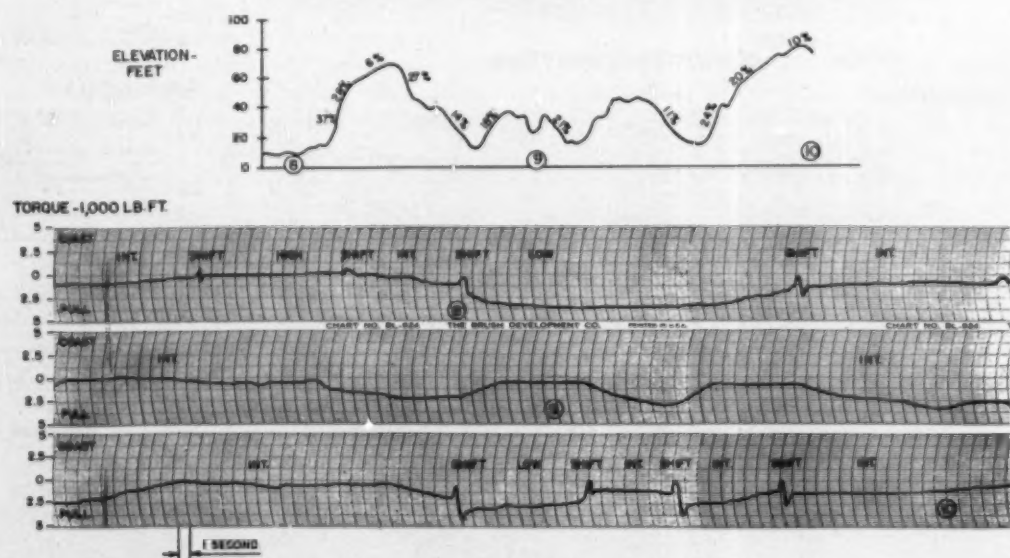
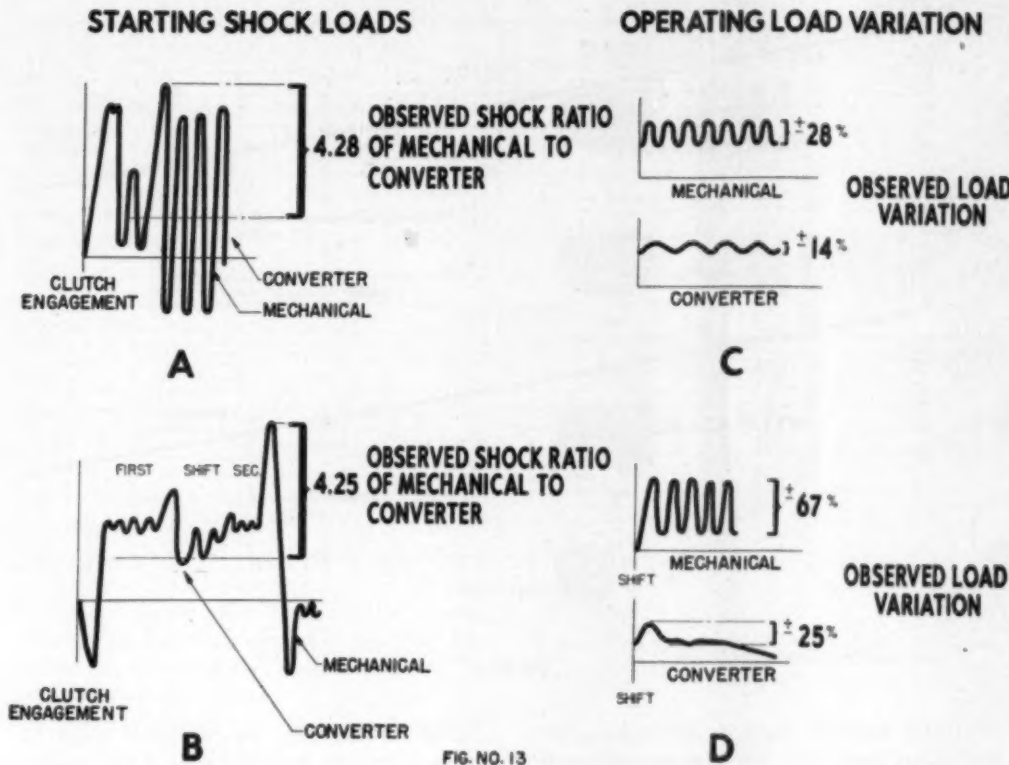


FIG. No. 12 C

RESULTS OF FIELD TESTS

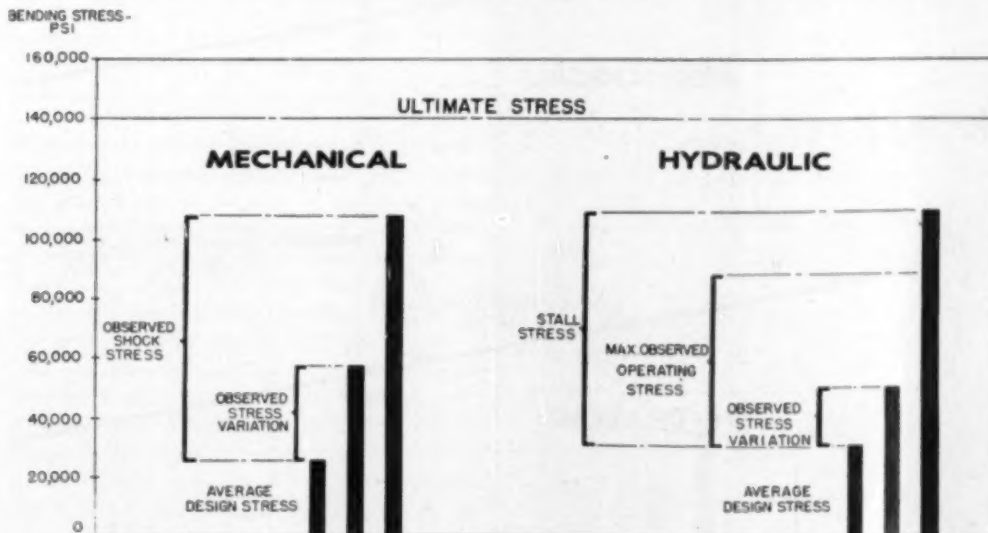


chanical because it is based on 1.25 times engine torque which we find produces normal life expectancy data for converter operation.

Using both design stress figures as a base, the effects of the load variation of each type of power train are illustrated by the load variation stress figures indicated by the chart. Also shown (Figure 14) is the relationship of the observed mechanical shock loads when compared with the mechanical design stress and also when compared with con-

verter stress based on the stall torque of the converter. The converter stall stress is also shown compared with the converter design stress. The observed mechanical shock load stress is approximately the same as that shown for the hydraulic stall stress. However, the observed operating load for the hydraulic is lower due to the smooth applied torque and continuous drive from zero at starting to the average observed operating load. According to our figures, the transmissions operated under the following stress conditions:

RELATIONSHIP OF TRANSMISSION DESIGN AND OPERATING STRESSES



	Hydraulic	Mechanical
Basic Average Stress psi.....	31,200	25,000
Load Variations psi.....	51,000	55,000
Shock Load Peaks psi.....		108,000
Observed Peak Loads psi.....	88,000	

It is seen from these figures that the relationship for the various observed operating stresses of hydraulic and mechanical transmissions may be shown as follows: Basic average stress is 25% greater for the hydraulic unit; load variation stress is 7.5% lower for the hydraulic unit; observed peak stress is 18.5% lower for the hydraulic unit.

It is commonly thought that transmissions used with torque converter drives must be designed for greater loads than those used with mechanical drives because of the engine torque multiplication through the converter. But considering all the factors in this particular investigation, the hydraulic unit has shown a lower overall operating stress when compared with the mechanical unit. It is an outstanding fact that the service life of transmissions is, more or less, governed by stress variations in the power train and that these variations affect and determine the actual life of transmission parts.

If the unit is operating at an average stress of 30,000 psi., but during the actual operation the stress varied from 20,000 to 40,000 psi., and assuming fifty percent time of operation at both stress levels, the life would be reduced approximately 56% compared with the life expectancy of the theoretical average. This illustrates the fundamental factors in establishing the operating stresses on both mechanical and hydraulic transmissions as compared to the actual design stresses that may be used (Figure 15). As a matter of fact if the stress varied from 10,000 to 50,000 psi. the life expectancy, compared with the average operating stress of 30,000 psi., would be reduced 86%. Using the average operating stress results in Figure 14 and the affects of stress variation as demonstrated in Figure 15, it is possible to show how shock loads and load variation affect transmission life expectancy.

First taking the observed stress variation for the mechanical unit from Figure 14, the total cycles are shown in Figure 16 at A and B. The maximum stress is represented by A and minimum stress by B. This constitutes the load variations due to load distribution and the resulting life range is established. The total cycles for a constant mean or rated load is represented by C. By assuming that the operating stress cycles are distributed fifty per cent at maximum and minimum stress during the working cycle, then the life expectancy would be represented by D which is lower than for the mean applied or average load. Next using the same line of thought for the hydraulic transmission, the life range is shown between A1 and B1 representing the narrower range of maximum and minimum stress for the observed load variation. The life for the mean or average load is indicated by C1 while the life D1 results from fifty percent operation at the maximum and minimum stress levels during the operating cycle.

STRESS VARIATION

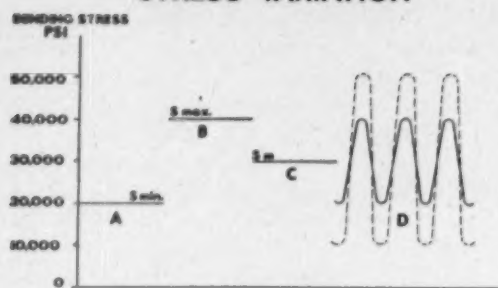


FIG. NO. 15

Comparing the total cycles for each load variation D and D1, the result would be 60% more life expectancy for the hydraulic transmission. It is important at this point to keep in mind that the difference in the load variation in the two power trains is responsible for the increase in life in the cushioned hydraulic drive. It also was shown in Figure 14 that there were shock and observed operating stresses in addition to the normal stress variation encountered in the operating power train.

If the two power trains were operated all the time at the extreme shock and observed operating stresses, the life expectancy would be indicated at A and A1 (Figure 17). However, from the charts we see that both transmissions do not operate full time at these points, but only a small percentage of the total time of the haul cycle. Investigation showed that, for various haul cycles studied, the best average time to use was approximately 2% of the total time cycle. Taking these two classes of loads and basing their operation on this time cycle, the life expectancy is shown at B and B1 (Figure 17) and comparing them with each other results in approximately 125% more service life for the hydraulic transmission.

It is observed from these two classes of loads—load variation, and shock and observed maximum operating loads—that the hydraulic transmission life, when compared to the mechanical unit, is greatly influenced by the smooth load application and the lower load variation as shown by the tests. When only the load variation factors are considered the hydraulic transmission life was increased 60% over the mechanical unit, but when the shock loads and maximum observed operating loads are combined, the hydraulic transmission shows 125% more life over the mechanical. Operators using both mechanical and converter drive trucks, not only co-operated with us in conducting tests to obtain data for this paper but also furnished maintenance records of engine transmission and differential overhaul life of these components to demonstrate the influence, if any, of the converter on the life of the power train components. The information gathered from several sources was not conclusive but did show a trend of better life for power train components when using torque converters.

For both types of trucks, the frequency of overhaul of power train components based on one engine overhaul is illustrated in Figure 18. These data were taken from all records that were available and averaged out to obtain the summation presented here. The mechanical power train showed 3.4 clutch, 3.18 transmission, and 0.76

LIFE COMPARISON OF MECHANICAL AND HYDRAULIC TRANSMISSION PARTS BASED ON STRESS VARIATION

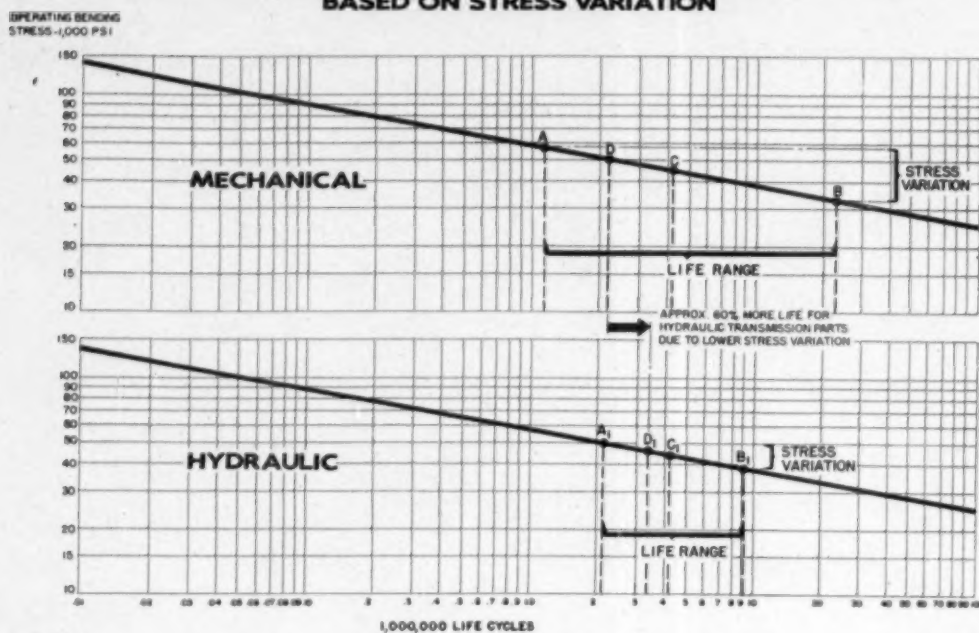


FIG. NO. 16

differential overhauls based on one engine overhaul. These figures were based on summer operating conditions. For winter operation the clutch overhauls went up to 10.2 per engine overhaul. The converter records showed that the transmission and differential overhauls were 0.62 and 0.575, respectively. However, the converter operated power train showed longer engine life than the mechanical unit, the ratio between the engines of the mechanical and converter units being 0.68.

In other words, when the mechanical engine has reached overhaul time the engine of the converter units has gone only two-thirds of its overhaul period. Thus the transmission and differential overhaul ratios of the converter unit will change to 0.42 and 0.39 respectively.

The field information presented in Figure 18 leads directly to a summation and comparison of the life of both mechanical and converter power

LIFE COMPARISON OF MECHANICAL AND HYDRAULIC TRANSMISSION PARTS COMBINING STRESS VARIATION AND SHOCK AND OPERATING STRESS

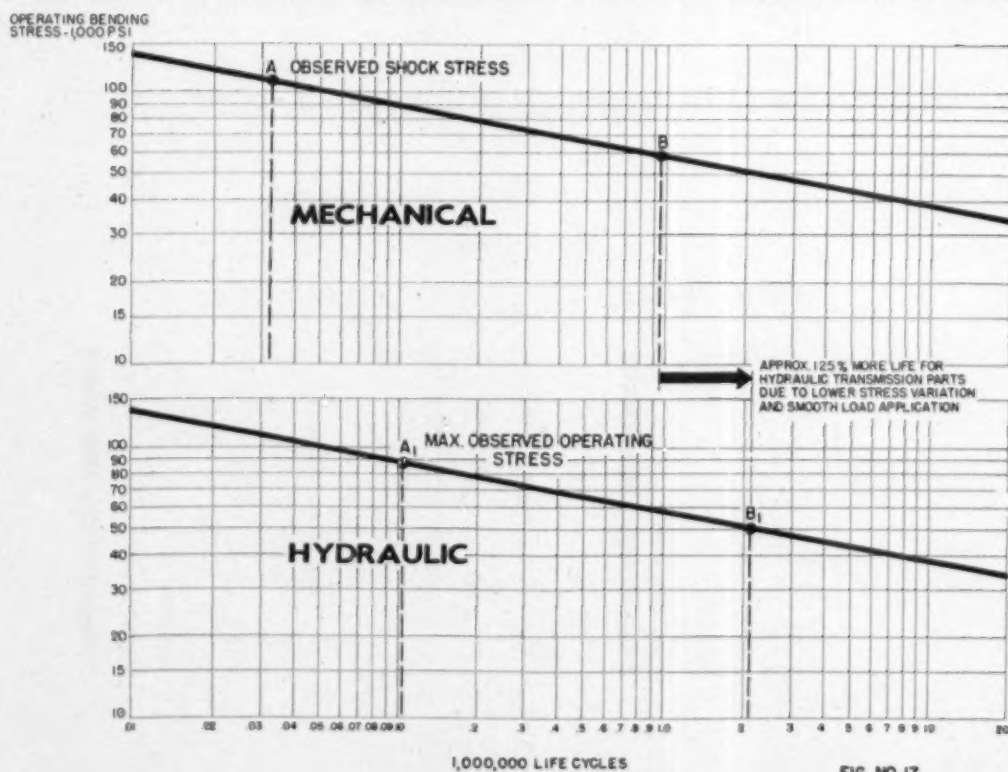
















FIG. NO. 17

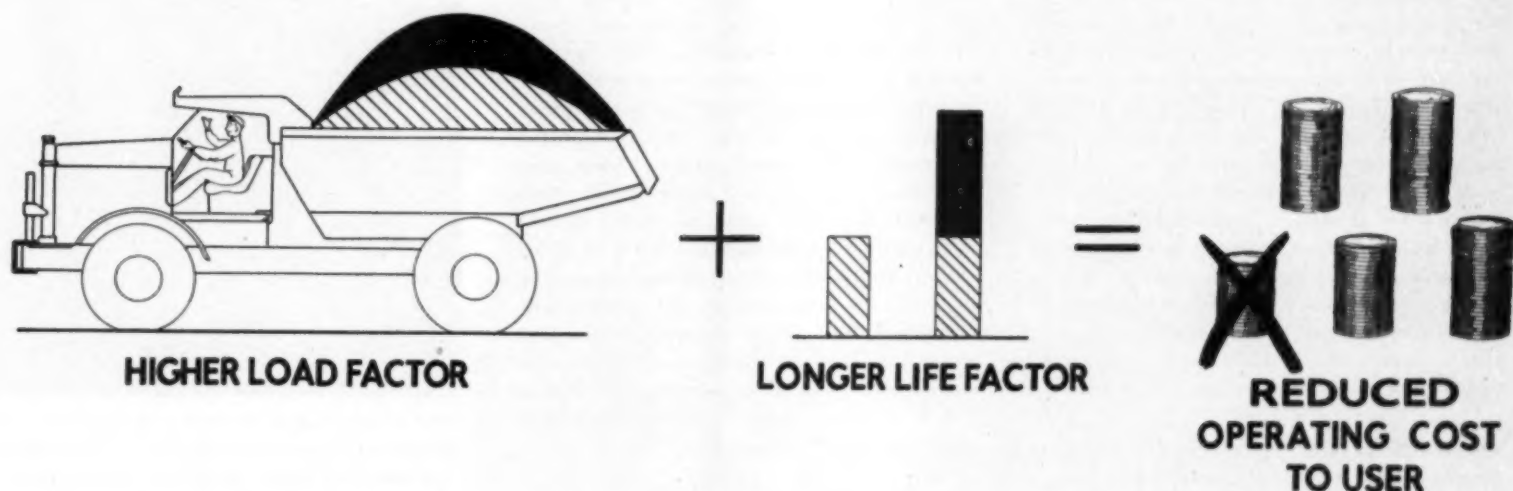
train components. Figure 19 shows the life of the engine, transmission and differential for both units and comparing both types of power trains the results may be listed as follows: The converter power train showed approximately 47% more engine life, 400% more transmission life, 93% more differential life. It has been pointed out before that these figures show a definite trend towards greater life for the power train components when using torque converter equipped trucks. Judging from the test data, there are three classes of loads imposed on the power train components that affect their life: (1) Starting—First are the starting loads in both converter and mechanical units. The mechanical unit experiences shock loads when starting the vehicle, and their magnitude is greater than the maximum observed stall load of the converter unit. (2) Shifting—The second type of load is that encountered in shifting the mechanical unit with resulting resonance. This kind of load is not experienced in the converter power train to any degree. (3) Load Variation—The third class is the normal operating load and is represented by the torsionals in the drive. This kind of loading condition is indicated by the magnitude of the load variation and its frequency during the truck operating cycle. Due to the absorbing ability of the hydraulic drive, smaller load variation and practically no cyclic frequency exists in the converter power train.

FREQUENCY OF OVERHAUL OF POWER TRAIN COMPONENTS
BASED ON ONE ENGINE OVERHAUL

MECHANICAL POWER TRAIN			
ENGINE	CLUTCH	TRANSMISSION	DIFFERENTIAL
 1	 3.4	 3.18	 .76
 1	 10.2*	 3.18	 .76
CONVERTER POWER TRAIN			
 1		 .68	 .575
 .68		 .46	 .39

*WINTER OPERATING CONDITIONS

FIG. NO. 18



In conclusion, since the torque converter eliminates shock loads when starting and stress variation caused by torsionals and resonance, we find the following things to be true in hydraulic transmission parts: Higher design stresses may be used. For equal life, it is possible to use higher loading. For equal loading considerable more life will be obtained. Operating data previously collected in the field and presented at the Earthmoving Industry Conference, April 1950, in SAE paper "Going to Work with Hydraulic Transmissions," indicated that with a converter the equipment can be operated at a higher load factor in order to get more work done. From the facts presented above, it is indicated that with a converter the equipment also has a greater life factor. Since the equipment can be operated at a higher load factor with longer life factor, the converter drive will result in reduced operating costs to the owner.

AVERAGE LIFE OF POWER TRAIN COMPONENTS

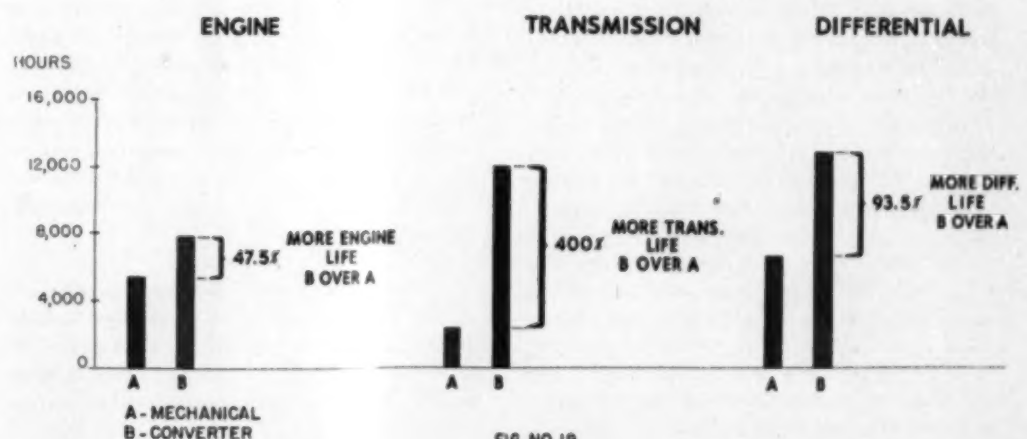


FIG. NO. 19

DIESELS IN FORK LIFT TRUCKS

By L. C. DANIELS*

THE Fork Lift Truck, as known today, is a far cry from the original lift trucks of 15-20 years ago, when they were practically glorified tractors, with an arrangement on the front for the lifting and carrying of materials. Stacking of materials 20 years ago, with floor space approximately half in cost as of today, was no particular problem. Therefore, the fork lift truck of today has had an evolution similar to most other types of mechanical equipment. First, came the hand pushcart, and then the powered platform truck; on to the electric fork trucks, and, as of the present time the gasoline powered fork lift trucks. As each improvement was accepted by industry, it opened new fields for fork lift trucks, which, when integrated with conveyor systems, etc. speeded up the flow of materials through manufacture, assembly, shipping and warehousing.

Like all machines, the fork lift truck and industrial towing tractor, electric or gas, has limitations which must be recognized. Most of the limitations have been set by safety committees, insurance companies and Underwriters' to improve the safety of fork lift truck operation. One limitation has been the source of power. The area that a truck can safely operate in is dependent upon the hazards involved. For example, a standard electric truck would be unsafe when operating in a dust laden atmosphere, due to sparks or flash from the contactors or controls; or a gasoline powered fork lift truck would be unsafe in an area where there was little or no ventilation due to carbon monoxide content in the exhaust gases.

The limitations of the fork lift truck still did not prevent the use of such equipment in Army and Navy Ordnance Depots, grain and flour mills, refrigerator rooms, paper warehouses, cotton mills and warehouses, etc. As a result, an attempt was made to reduce or eliminate the possibility of fires caused by gas fork lift trucks when operating in hazardous areas, such as spark proofing, safety gas tank caps, water mufflers and water manifolds, etc. In the case of electric trucks, all wiring was shielded and contactors and motors enclosed in gas tight compartments. The batteries are encased in gas tight compartments. To prevent conductive material from falling across the terminals, or dust accumulating, and thus shorting out the batteries, these gas tight battery compartments must be purged with an inert gas to remove hydrogen that is formed by the battery, which is an unstable gas, and in itself presents an explosive hazard. Electric

trucks so equipped and maintained in excellent condition were used throughout the war to handle high explosives, and in a large degree, did a very fine job. However, there were still incidents of fires, explosions, etc.; the preventative measures are not foolproof.

In the case of gasoline powered equipment operated in hazardous areas, there were the basic problems encountered with the electric truck, such as: sparks from the starter, generator, high tension wires shorting, etc., and, in addition, the problem of hot exhaust manifolds and sparks of hot carbon being blown out along with the exhaust gases. The problem of hot exhaust manifolds and hot carbon sparks was eliminated by use of water cooled manifolds and water mufflers. These units were very satisfactory, if they were designed for each individual truck and properly maintained. However, with gasoline powered equipment, the danger from carbon monoxide was always present, and, should there be insufficient ventilation, there was no warning of this danger, unless a mine safety appliance carbon monoxide detector was used. One approach to this problem was the use of catalyst type mufflers, which could eliminate carbon monoxide from exhaust gases, if certain specific conditions were met. For example: the muffler must be up to temperature approximately 500°F. or higher and maintained. Also, white unleaded gas must be used to prevent contamination of the catalyst units, as lead bromide would coat the units, making them in-operative. Under full operating conditions, the catalyst muffler reached temperatures as high as 1100°F. This again creates a fire hazard, in areas with explosive dusts or liquids.

The foregoing are the most important objections to the use of either gas or electric powered equipment in hazardous areas. There are other objections based on individual conditions which could be made workable with above safety measures, but the industry is demanding better safety measures, or better still, a source of power that will eliminate all, or most of the hazards previously discussed. Therefore, the diesel engine, which proved its merit in underground operations where there is constant danger from dust accumulation and explosive gas conditions, combined with limited ventilation, seemed to be the answer to a major portion of the problem.

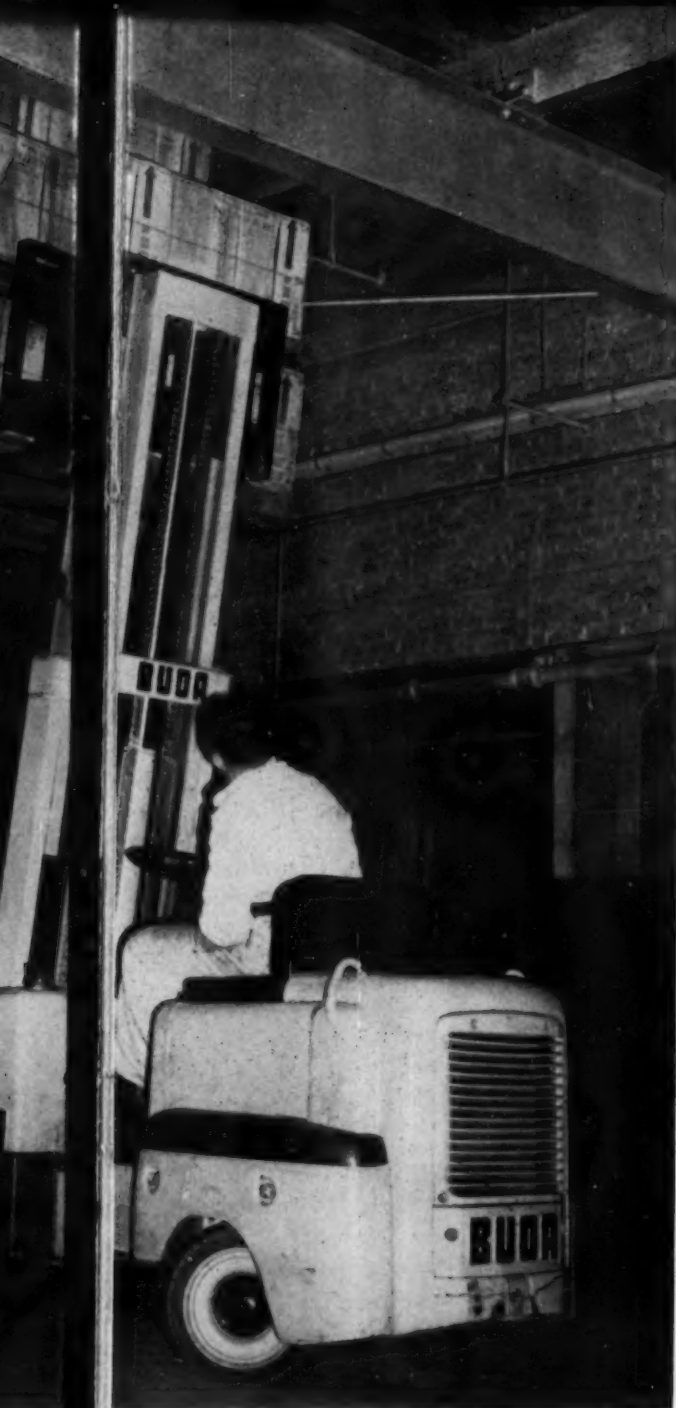
The experience gained by over two years of experimental testing and operation of dieselized fork lift trucks has proved this to be true. To eliminate the problems of electric powered equipment a diesel engine can be started and operated without electric equipment at all.



The engine can be started with either a compressed air starter or a hydraulic starting motor. The source of power, for either type of motor, is supplied from a compressed air tank or a hydraulic pressure accumulator. Providing there are objections to this type of starting the electric starting motor can be used, and portable battery equipment used for starting outside of the hazardous areas detached from the truck by quick detachable coupling. The truck can then be driven into the hazardous areas without danger of the starting motor being used, as without batteries on the truck, the starting motor can do no harm. As the diesel engine requires no spark plugs, there is no need for battery, points, generator, or any other electrical equipment. This eliminates the electric hazards encountered with electric and gas fork lift trucks.

The dieselized fork lift truck is also free from some of the basic hazards encountered with gasoline powered equipment. The elimination of carbon monoxide is relatively simple and positive. In a diesel engine the intake stroke consists of filling

*Vice President of the Buda Company. Talk presented at the SAE National Diesel Engine Meeting, St. Louis, Missouri, October 31, 1952.



the cylinder with pure air, then the proper amount of fuel injected can be controlled within a very close range so that throughout the life of the engine the fuel air ratio can always be maintained so that the air fuel ratio is controlled to the point of complete combustion, thus eliminating the by-product of incomplete combustion, carbon monoxide. As we know, there is always a danger of carbon monoxide even with a fuel air ratio lower than theoretically perfect. This is due to free oxygen not combining with fuel, because of fuel concentration in the combustion chamber. In the diesel engine, this problem is eliminated by the proper design of the combustion chamber. The use of an energy cell causes a violent swirling action in the combustion chamber a split second after combustion has started. This swirling action breaks up high fuel concentration, and thus aids complete combustion. From our own experience, as well as from tests conducted by the Navy, it has been proven that the carbon monoxide content of the diesel exhaust can be reduced to almost zero, which is far below the safe limit for working in confined storage or shop areas.

Another very important inherent characteristic of the diesel engine is the formation of aldehydes in the combustion chamber. From our experience, the percent of aldehydes increases or decreases with the fuel air ratio. Thus when this ratio is maintained below the safe limits, the aldehydes produced are almost impossible to detect by smell, and far below the irritation limits. However, should a diesel engine be operated for a prolonged time in a poorly ventilated area, the smell of the aldehydes would serve as a warning long before the carbon monoxide concentration would approach the danger limits, thus with a diesel engine you have an automatic carbon monoxide safety signal.

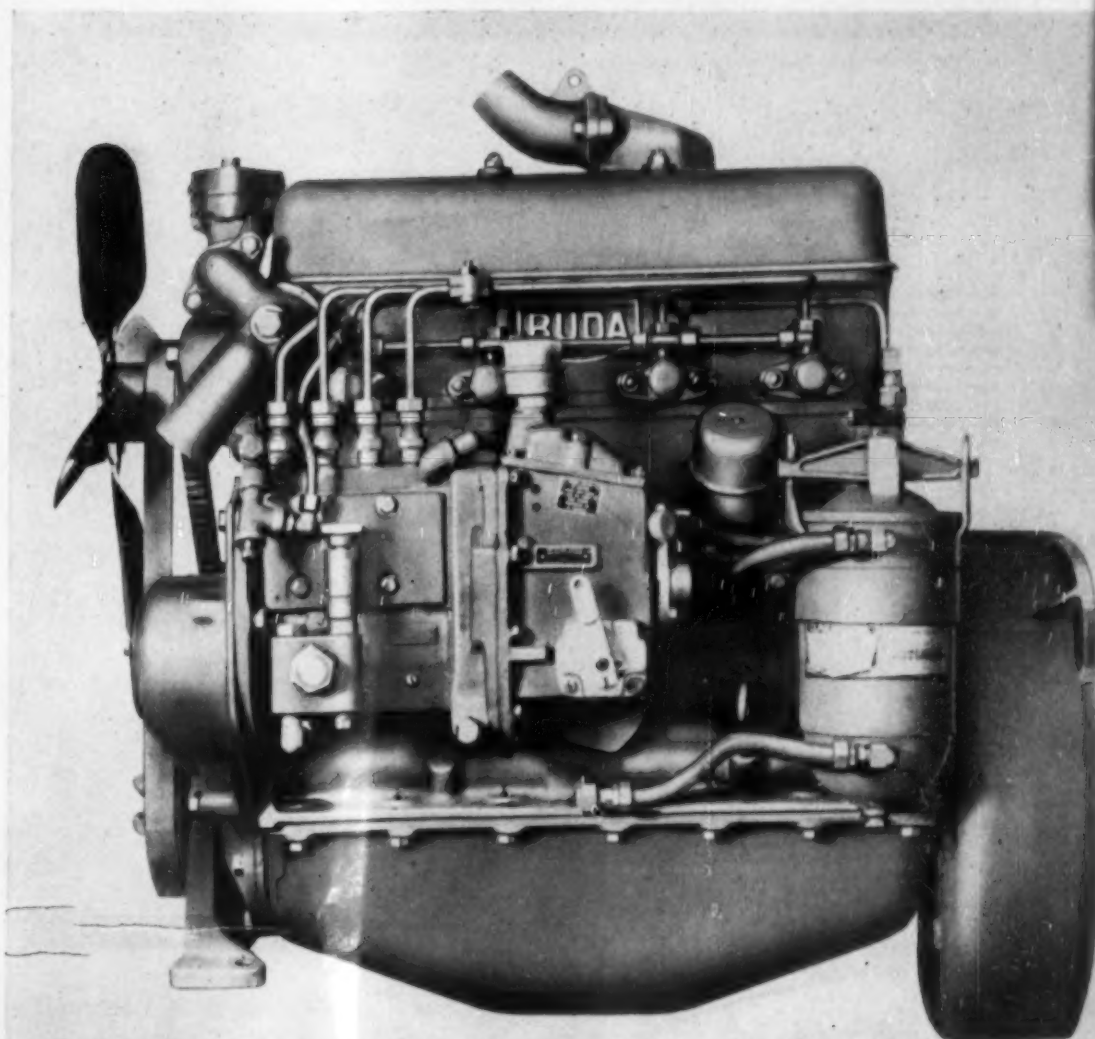
The problem of hot exhaust manifolds and gases is not as critical in a diesel engine as in a gasoline engine due to a more efficient combustion cycle, which results in lower exhaust gas temperature. Thus, water cooled manifolds will transfer less heat load on the cooling system, and water mufflers running at considerably lower temperature will have better water retention life and be more efficient.

In working with diesel engines in fork lift trucks and a water muffler of our own design, we find that we are able to operate continuously without refilling for over 14 hours at peak performance, remove all sparks and reduce exhaust temperatures to around 300°F. With the diesel engine and water muffler, with proper exhaust baffling, the temperature of the exhaust gases are reduced to about 200°F. at the tail pipe, which is considered a safe temperature for almost any hazardous area.

With the above features designed into and around the diesel engine, a source of power is now available which has eliminated the hazards of both electric and gasoline powered equipment. The need for safer material handling equipment prompted the adoption and perfection of diesels in fork lift trucks. However, the industry has gained because of other features which are inherent in a diesel engine. The economy of a diesel engine has long been recognized by the trucking industry. Our files contain records of diesel engines which have operated 283,000 miles between overhauls. This long life inherent in over-the-road diesels can also be projected to diesels in fork lift trucks. At the present time, they have not been in service long enough to compile comparative figures, but if the trucking industry can be used as a criterion, we can expect from 25 to 50 percent longer engine life. Our gasoline and diesel engines are industrial type engines, which are equipped with wet sleeves, five main bearings for the four-cylinder engine, and seven main bearings for the six-cylinder engine. While these improvements cannot be predicted to be standard with the fork lift truck industry, in our case they definitely do add to long engine life.

The economy of diesel fuel versus gasoline is now an established fact. Also, the reasons for this economy are very well known, so we will not discuss them at this time. However, the following comparison may give some idea of what can be expected in fuel economy alone. This comparison was run with fork lift trucks equipped with a 230 cubic inch diesel and a 226 cubic inch gasoline engine.

The Buda model 4-BD-133 diesel engine which powers the Buda fork lift truck illustrated on this page. Bore 3-7/16 in.; stroke 4 1/4 in.; piston displacement 103.1 cu. in. A 4-cycle, 4 cylinder full diesel unit.



	Gasoline	Diesel
Average gallons of fuel per hour	1.2	.62
Fuel cost per gallon	\$.234	\$.129
Fuel cost per hour	\$.2808	\$.07998
Savings in diesel over gasoline per hour		\$.20082

This savings, based on an 8 hour day, five days a week, 4 1/4 weeks per month would result in the following:

Savings per 40 hour week	\$ 8.0329
Savings per month	\$ 34.782
Savings per 52 week year	\$417.56

The additional cost of dieselized fork lift trucks of the 6000 lb. and 7500 lb. capacities should not exceed \$1000.00 over the cost of the equivalent gasoline powered fork lift truck. The additional cost, due to savings in fuel only on this basis, would pay for the diesel engine in approximately 27 months. Due to increased engine life, which has been cited previously in this paper of 25% to 50%, this would reduce the time required to offset the additional cost of the diesel engine considerably. This savings, based on a 5-year write-off of the fork lift truck, would be sufficient to cover the cost of the diesel engine in a truck replacement program. The above comparison giving the savings in fork lift truck operation also applies in the use of towing tractors equipped with diesel engines. The savings in fuel, however, are only part of the savings due to the use of the diesel engine.

Another savings which would apply under certain operating conditions is in the case of stevedoring on docks. The constant danger from fire, due to gasoline spillage, is known to all of us, however, the following comparison between gasoline and diesel fuel will serve to show why, as in the case of Port Authorities, gasoline powered equipment

is considered dangerous, even though there are no particularly hazardous areas involved.

Gasoline, depending upon whether it is summer or winter grade, has a vapor pressure of between 7.5 to 13 pounds per square inch. Diesel fuel has a vapor pressure of almost zero. This is a comparison to show the difference in volatility between the two fuels. A further comparison of the fire hazards resulting from spilled fuels is the flash point. Gasoline has a flash point of minus 80°F., while diesel fuel has a flash point of approximately 200°F., or a difference of 280°F. While the flash point is not the true kindling temperature of a fuel, it still can be used as a yardstick to compare the fire hazards.

For this reason, the Port Authorities have taken their stand to permit diesel equipment to be fueled on the docks, while gasoline powered equipment must be taken off the dock to be stored, refueled or serviced. Diesel equipment can be stored, refueled or serviced on the docks or in the holds of ships. This restriction on gasoline fork lift trucks makes it necessary to provide storage space and garage facilities as close to the docks as possible.

One operator advised that the storage garage rental amounted to \$30,000 per year. All trucks had to be driven there at night and back to the docks in the morning, which resulted in a work day costing 8 hours operation, but resulting in less than 8 hours' work, or a resultant higher cost of operation. Any time a truck required normal maintenance, adjustment, or refueling, a crew with a tow tractor had to be called, the truck towed back to the garage, tuned up or refueled, then driven back to the dock. Also, fuel pilferage, which could not be controlled in this operation, resulted in an average loss of one gallon of gas per truck per day. The company referred to operated 100 trucks, or a

loss of 100 gallons of gas per day, which resulted in \$24.00 a day loss due to pilferage.

The full advantages of dieselized industrial equipment has not yet been fully realized. We, who have done much to pioneer in this development, are still receiving new reports of economy and safety in specific types of operation, as well as numerous requests to investigate and approve operations, which, until the present time, were considered too hazardous for electric or gas powered fork lift trucks. The public, however, still remembers the old diesel truck smoking its way merrily down the highway, and finds it hard to believe a diesel engine exhaust can be as clean as a gasoline engine. Regardless of the fuel air ratio being increased, the power of the diesel engine continues to increase. This is the exact opposite of the gasoline engine. When the fuel air ratio of a gasoline engine exceeds 14 to 1, the power output of the gasoline engine decreases. Consequently, diesel engine operators, particularly of the over-the-highway type are anxious to secure all the power possible to reduce running time regardless of the fuel cost, which is still 50% of gasoline costs. Therefore, they increase fuel injection to gain this additional power and better highway performance. Whereas, with the diesel engine in fork lift trucks, this increased power is unnecessary, due to the high numerical axle and transmission ratios, low speeds and resultant high performance of the fork lift trucks. This is always a point of interest to us, especially when people observing a demonstration ask, "Which are your diesel trucks?"

Even though the diesel fork lift truck is still in its infancy, the examples cited show the great possibilities for new fields, which will reduce bottlenecks in our flow of materials to basic industries and result in more goods at lower costs for all of us.

The Buda FT series fork lift diesel trucks are available in capacities of 3,000, 4,000, 5,000, 6,000, and 7500 lb., powered with either Buda diesel or gasoline engines. Over 85% of replaceable parts and assemblies are interchangeable between all 14 models of the Buda FT series fork lift trucks. All diesel models are identical to the gasoline models except for engine.



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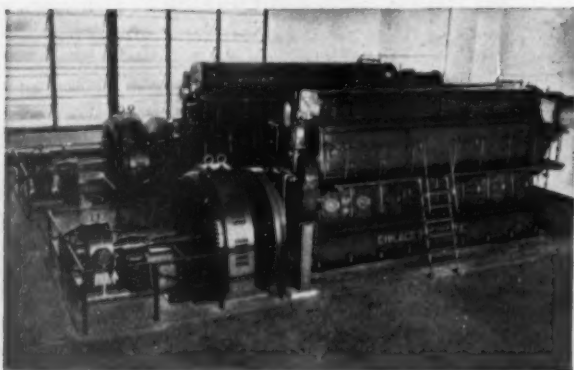
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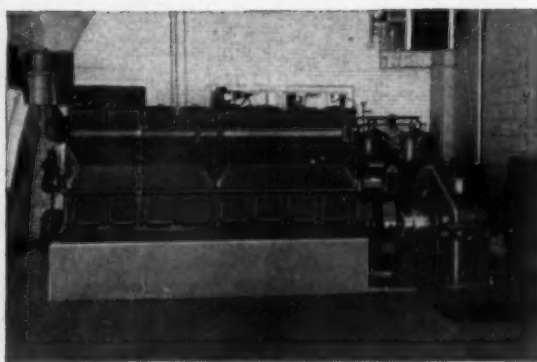
CP medium and slow speed Diesel Engines



Two CP 1500 H.P. Diesels in a western public utility station.



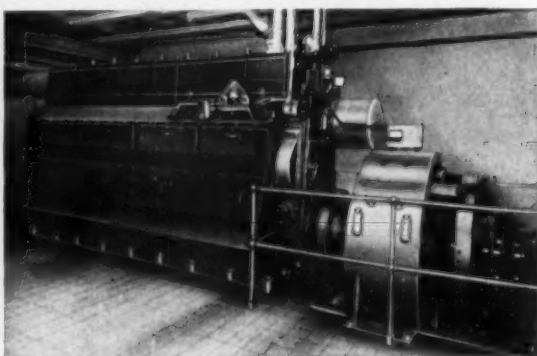
CP 1650 H.P. 3-cylinder Diesel in well known industrial plant.



CP 400 H.P. Diesel in petroleum pipeline station.

Available in sizes ranging from 120 H.P. to 1750 H.P., these engines can be furnished either for straight Diesel or for Dual Fuel operation. The CP line includes both normally aspirated and supercharged engines, all the latter incorporating the thoroughly dependable Elliott Turbocharger.

CP Diesels have proved profitable investments for public utilities; industrial, municipal, ice and water-works plants; and in mining, oil, pipeline, cotton ginning and other fields where low cost, dependable power is a vital necessity. Write for complete information.

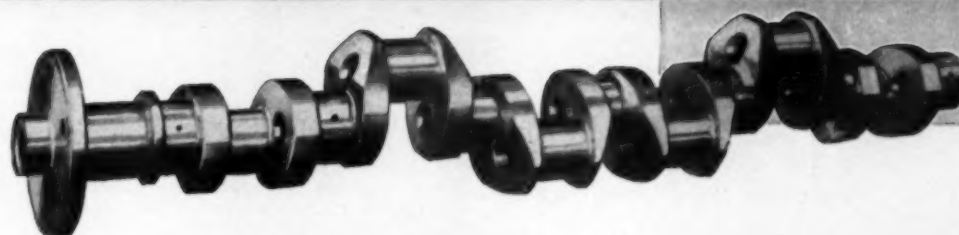


CP 640 H.P. Diesel in large laundry.



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NORDBERG SPARK-FIRED GAS ENGINE

PRODUCTION of a series of four-cycle spark-fired gas engines is announced by Nordberg Manufacturing Company. These engines, known as Types FSE-9 and FSE-13, are built with 9-in. and 13-in. bore sizes respectively in non-supercharged, supercharged, intercooled-supercharged and Supairthermal types covering a range of 265 to 4260 horsepower. Both these engines economically burn natural gas, butane, propane, manufactured gas and sewage gas. Other gases of lower btu. content can also be used, but at reduced ratings. These engines have the same basic heavy-duty construction features of Nordberg four-cycle diesel engines and where gas is available on the seasonable basis, the spark-fired gas engines have the additional advantage of being convertible to 100 per cent fuel oil or dualfuel operation.

Outstanding among the operating advantages of these spark-fired gas engines, however, is their high thermal efficiency. This efficiency ranges in excess of 41 per cent with the Supairthermal type engine to 38 per cent with the non-supercharged engine. This high efficiency in all Nordberg gas engines is the direct result of expansion ratios up to $12\frac{1}{2}$

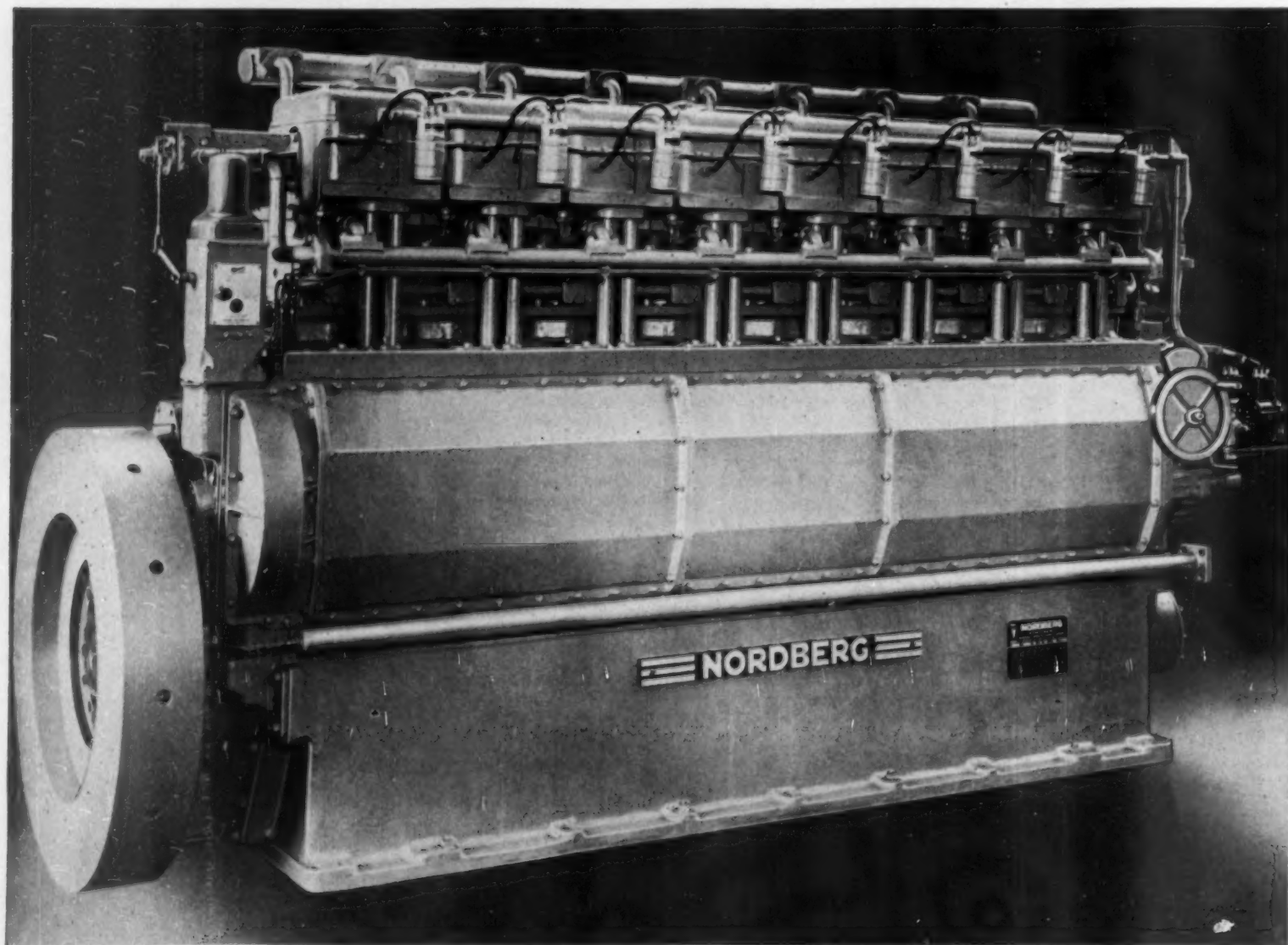
to 1 and controlled air-fuel ratios by variable inlet valve timing. To assure smooth, uniform combustion, the correct air-fuel mixture is maintained by the precise timing of the inlet valve. In all these gas engines, the compression ratio can be selected to any desired value independent of the expansion ratio. For example, the Supairthermal gas engine has a clearance volume $1/11\frac{1}{2}$ of the total cubic inch piston displacement. At full load, the inlet valve may be closed at a point when the piston has displaced a volume only eight times greater than the clearance volume. This results in a compression ratio of 9, but the expansion ratio of $12\frac{1}{2}$ is maintained. As a result, the Supairthermal engine has the required low compression temperature to operate with minimum excess air without detonating and a high thermal efficiency due to the high expansion ratio. Diagram A, illustrating the heat balance of the Nordberg Supairthermal spark-fired gas engine, clearly shows the high thermal efficiency resulting from this system.

The Nordberg gas engine can be operated without pre-ignition or detonation with a mixture having a small percentage of excess air. This is closer to

the chemically correct air-gas mixture than obtainable with any other supercharging system. With this air-gas ratio, combustion is rapid and uniform. Two highly efficient ignition systems have been employed on these engines. On the FSE-9 engines, a low voltage impulse type magneto with distributor, external coils, high compression shielded spark plugs and low and high tension cables are used. One spark plug is used in each cylinder. The magnetos generate and distribute low voltage current through the low tension cables to individual coils adjacent to each plug. High voltage current from the coils is then conducted to each spark plug at the proper firing interval of the respective cylinder. An impulse coupling on the magneto provides a hot spark at engine cranking speed and retards the spark automatically to insure easy starting.

The ignition system used on the FSE-13 engines consists of an impulse generator, selenium rectifier which generates electrical impulses similar to a half-cycle of a conventional A-C wave, transformer-coil and spark plug resistors. Two spark plugs are used in each cylinder and are mounted in water cooled holders. The generator produces an igni-

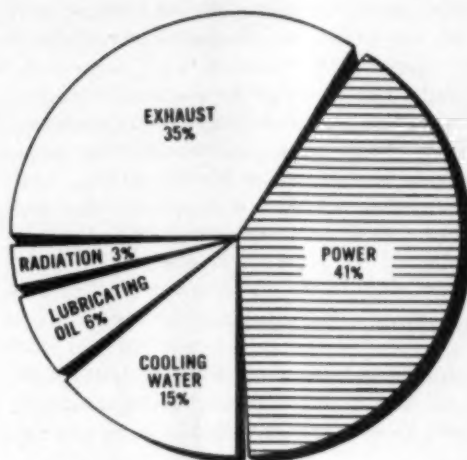
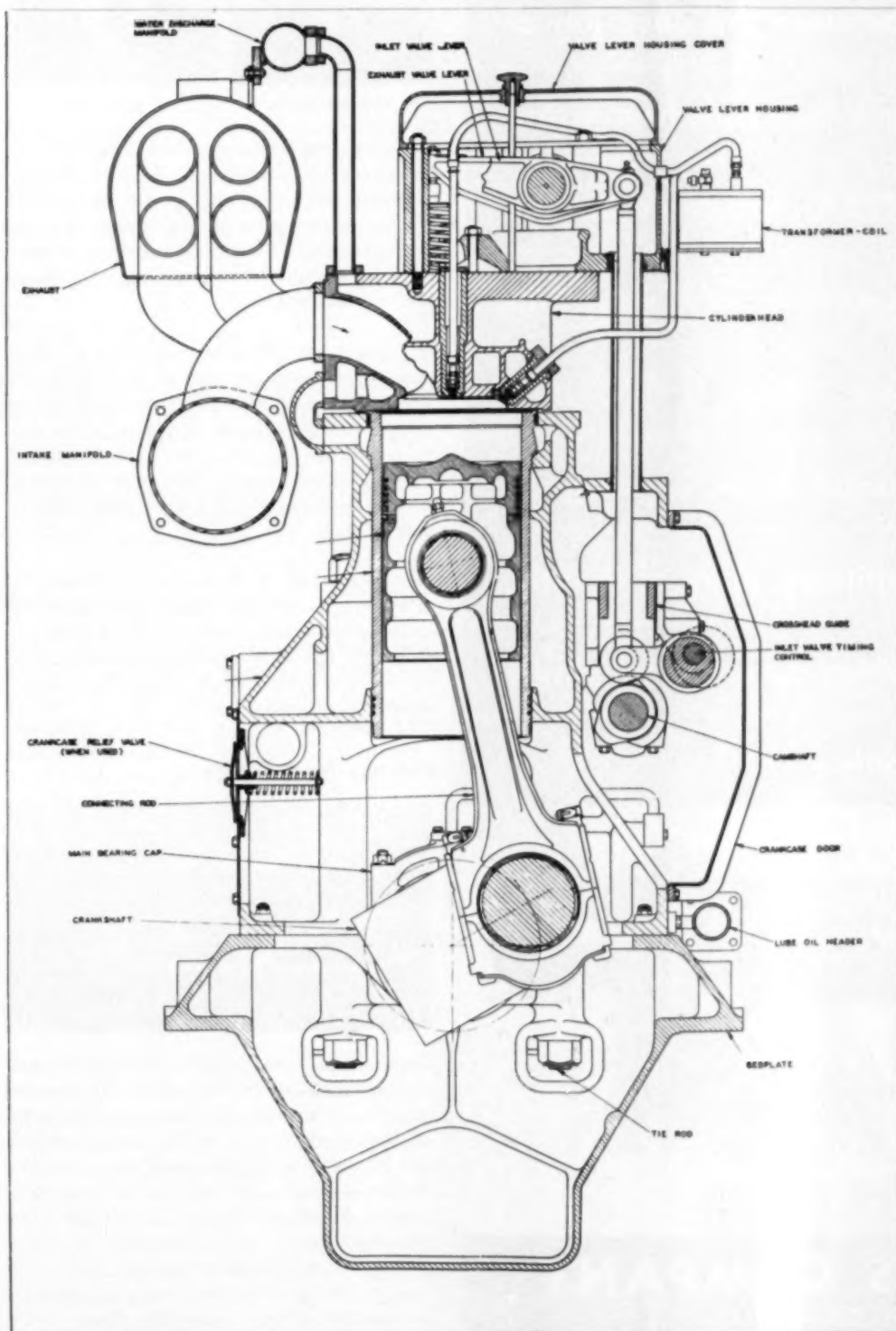
Operating side of a Nordberg Type FSE-9B-SC eight cylinder, supercharged spark-fired gas engine rated 490 hp. at 600 rpm.



Heat Balance of a Nordberg Supair-thermal spark-fired gas engine.

tion impulse which is accurately timed with the firing point of each cylinder. The principles employed in this generator eliminate the use of the conventional cam and break point arrangement usually found in ignition systems. These Nordberg spark-fired gas engines are well suited for pipe line pumping service, oil refining and production, industrial and municipal power plants, public utilities, sewage plants, oil well drilling rigs, etc. Several 13-in. bore six and eight cylinder engines are now on order for pipe line pumping service.

Cross section through a Nordberg four-cycle, 13-in. bore Supairthermal spark-fired gas engine.



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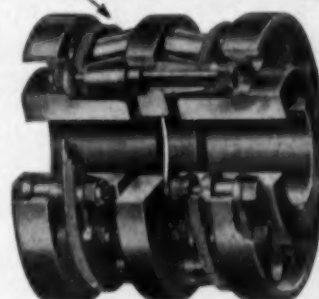
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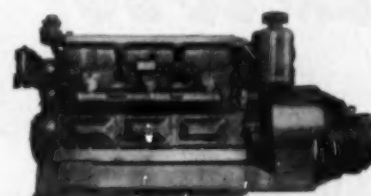
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Opens New Plant

Stewart and Stevenson, one of the nation's largest distributors of General Motors diesel engines, has announced the opening of its new and larger plant in Corpus Christi, Texas. The new building, a completely modern structure located in the city's newest industrial district, provides for greatly expanded engine repair facilities as well as a proportionately increased stock of engine repair parts.

The announcement was made by R. N. Conolly, manager of the company's South Texas operations, who said Stewart and Stevenson Services had been supplying the power needs for all oilfield, industrial, marine and agricultural industries in that

area since they became established there in 1946. "Our new location on the city's northwest edge," Mr. Conolly said, "eliminates heavy traffic problems for our incoming customers." The Corpus Christi plant is a branch of Stewart and Stevenson Services headquarters in Houston with other branches and sales offices in Wichita Falls, Lubbock, Dallas, San Juan, Longview, Odessa, San Antonio, Brownsville, Beaumont, Laredo, and Port Arthur.

Distributor Appointed

Bearing & Transmission Products of Eureka, California has been appointed as a stocking distributor of Aeroquip reusable hose fittings, hose, and self-

sealing couplings. The company is managed by Mr. J. H. Jacobs, well known in the industrial trade of Humboldt and surrounding counties. Bearing & Transmission Products will stock Aeroquip's complete industrial line thus being in a position to serve the lumber, marine, trucking, construction and agricultural industries operating along the north coastal area.

Two Appointments



R. R. Seward, Jr.

W. A. Stringer

Paul R. Turner, director of sales of Electro-Motive Division of General Motors at La Grange, Illinois, has announced two new appointments. R. R. Seward, Jr. becomes merchandising manager, a newly created post, at La Grange. W. A. Stringer becomes sales representative of the southeastern division of EMD at Jacksonville.

Mr. Seward joined General Motors in 1936. Since then he has served in sales of General Motors Truck and Coach Division, material control with Eastern Aircraft Division, education, safety and public relations with Fisher Body and manager of General Motors Train of Tomorrow. He joined EMD in December 1949 as assistant parts merchandising manager.

Mr. Stringer joined EMD as an operating instructor in 1945. He has served as delivery co-ordinator, assistant manager and manager of the delivery section of the Service Department. More recently, he has served as sales manager prior to his appointment as sales representative.

Delivers New Tanker



Late last year, Burmeister & Wain delivered a new tanker, the *Brattland*, to its owners, Aktieselskabet Borgestad of Norway. The vessel has a length between perpendiculars of 464 ft., breadth moulded 62.7 ft., and a side height to summer load line 27.5 ft. Its speed on loaded trials was 14 knots. The propulsion plant is a Burmeister & Wain direct reversible, single acting, two-stroke, 6-cylinder cross head diesel with airless injection. Bore is 29.13 in. with a stroke of 55.12 in. It develops 4600 bhp. at 110 rpm.

There is a vast difference between the easy job of

removing warm water, dirt, and pipe scale from warm

diesel fuel (Vis. 35SSU @ 122°F) compared to the

almost impossible job of removing cold water, or

ice crystals, from cold, viscous diesel fuel @ 10°F.

The 4-Stage EXCEL-SO Separator/Filter is designed

to operate under these conditions, more efficiently,

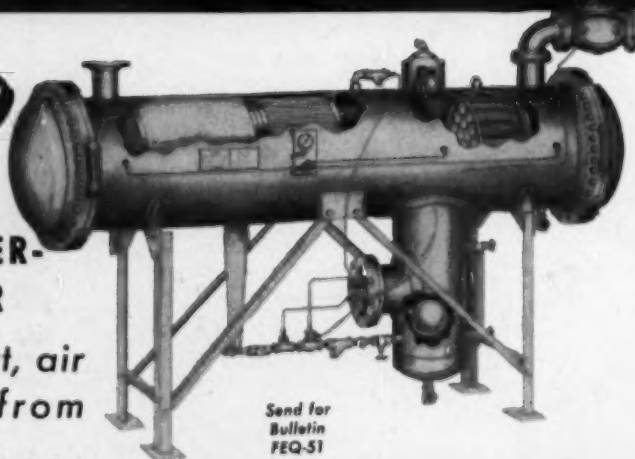
at less operating expense, than conventional single

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removes water, dirt, air
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Dynamometer Test on Overhauled Diesels



This is an important advance in diesel engine servicing, Mr. Brecht said. With this equipment distributors can assure owners their rebuilt engines will operate satisfactorily at the specified horsepower without further down-time for adjustment in the field. The dynamometer run-in also provides a careful check under controlled conditions of newly assembled parts and workmanship. In addition piston rings, bearings and other moving parts are seated to the extent that engines are ready for full-load operation as soon as they are returned to the job. Complete instruction in dynamometer testing is now offered to distributors' personnel in Detroit Diesel's service training school, Mr. Brecht said.

Running dynamometer tests on rebuilt and overhauled diesel engines is rapidly becoming standard procedure in the service departments of many diesel engine distributors and dealers. According to A. F. Brecht, service manager of the Detroit Diesel Engine Division of General Motors, a recent survey revealed that over 60% of the division's distributors had, within the past 18 months, made this service available to their customers.

Sealed Power Promotion

Donald M. Hesling, director of research and engineering of Sealed Power Corporation, Muskegon, Michigan has been advanced to the position of manager of manufacturing and engineering. The announcement was made by Paul C. Johnson, president. In his new position, Mr. Hesling will have complete charge of all of the company's manufacturing operations, plus engineering and research. The company operates plants in St. Johns, Michigan; Rochester, Indiana; and Stratford, Ontario, besides Muskegon. Mr. Hesling is a member of the Society of Automotive Engineers and the American Institute of Electrical Engineers.

New Distributors in New York Area

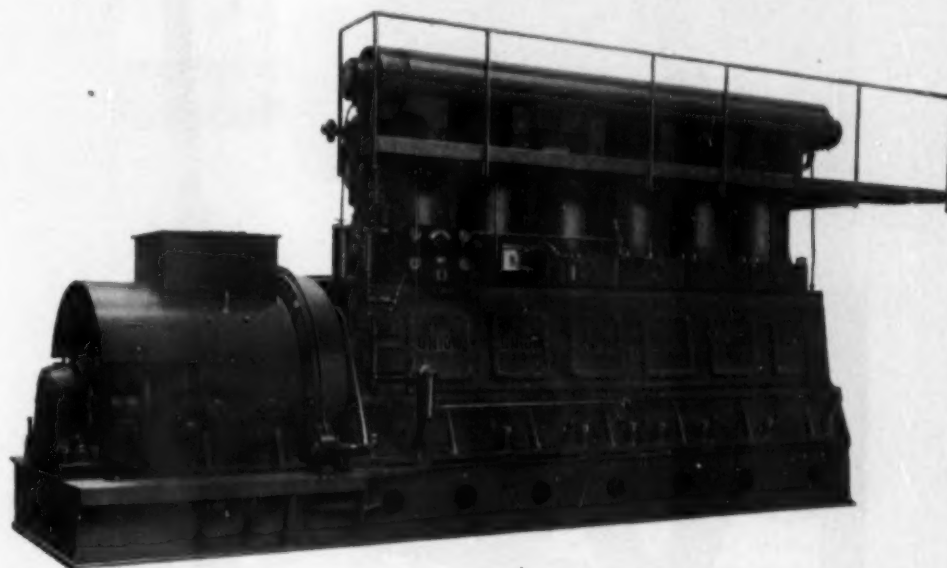
Concluding a business association of over 35 years, the well-known firm of Bowler, Holmes & Hecker Company discontinued the distributorship of Gray Marine engines on October 15. Mr. H. E. Holmes, president of the company, was semi-retired, and the business moved from the old address at 259 Greenwich Street. The new location of Bowler, Holmes & Hecker Company is 123 Chambers Street, under the management of Mr. George W. Bowly, and products handled include Federal propellers, bronze and monel shafting, Bowers bat-

teries, Marine Products pumps, Aqua Clear products, and other equipment items.

Leston W. Cloak, formerly executive vice-president of Bowler, Holmes & Hecker Company, and active member of Marine Trades Association, has formed a new company for distribution of Gray Marine engines, serving the area previously covered by Bowler, Holmes & Hecker, excepting Northern New Jersey. Mr. Cloak is also honorary president of American Inboard Association, sponsor of the annual Harwood Trophy Race around Manhattan Island. The new company, Leston W. Cloak Marine Corporation, is located at 309 Sunrise Highway, Lynbrook, Long Island, New York. The location was carefully selected in relationship to the

large boating concentrations of the area. The company also has distributorship for Paragon Gears. A large stock of parts will be maintained, with excellent parking and shipping facilities.

Gray further announces the appointment of Mack Boring & Parts Company, 266 Halsey Street, Newark, N. J., as Graymarine distributor serving the Northern New Jersey area formerly supervised by Bowler, Holmes & Hecker. The Newark organization, which is also distributor for Continental Motors Corporation, has an unusually fine shop and large parts stock, specializing in motor rebuilding, engine sales and service. The company is owned and managed by Mr. E. McGovern and son, Ed McGovern, Jr.

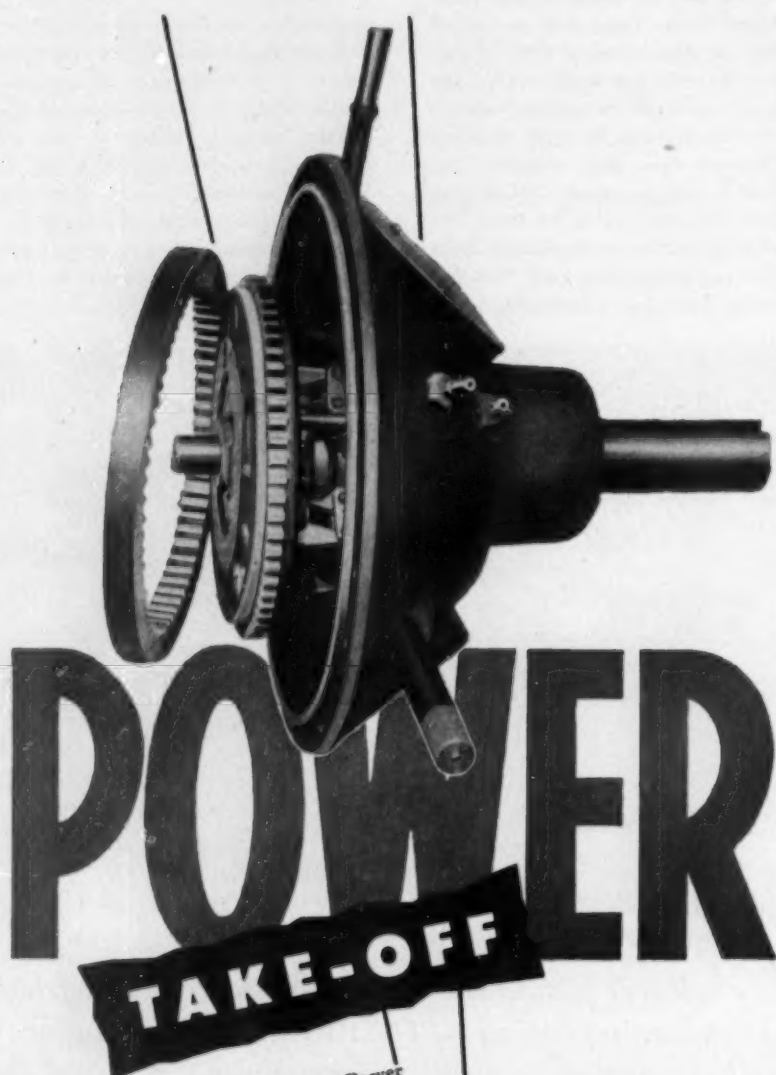


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UNION DIESEL

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There's more to a Twin Disc Power Take-Off than meets the eye. They last, and last... because—driving and driven plates provide positive clamping action; slipping capacities are in excess of rated capacities; tolerances are more exact, to assure quicker, easier engaging and disengaging. And when they do wear out, they're backed by the fastest, most thorough service program in the field—with 60 Parts Stations, 8 Factory Branches—fully staffed and stocked. If power take-offs enter your industrial power picture, consult Twin Disc first. Call your nearest Twin Disc Factory Branch where stocks are maintained for emergency requirements.

Twin Disc Power Take-Offs are available with clutches ranging from 6.5" to 24" single-plate, from 11.5" to 24" double-plate. Housing sizes No. 6 S.A.E. to No. 00 S.A.E. Capacities up to 650hp. Write for complete specifications, Bulletin No. 129-C.



BRANCHES: CLEVELAND • DALLAS • DETROIT • LOS ANGELES • NEWARK • NEW ORLEANS • SEATTLE • TULSA

General Sales Manager



Homer W. Sussman

Columbia Electric Mfg. Co., manufacturer of electrical equipment, 4519 Hamilton Avenue, Cleveland, Ohio, has announced the appointment of Homer W. Sussman as general sales manager. Mr. Sussman joined Columbia as a student engineer in 1935, immediately after receiving his B.S. degree in electrical engineering from Case Institute of Technology and has held various positions in the engineering and sales departments. In his new position he will assume responsibility for an expanded sales program covering the company's line of alternating and direct current generators, low voltage generators and motor generator sets, synchronous motors, tank rheostats and electrical instruments. He is a member of the American Institute of Electrical Engineers and Association of Iron and Steel Engineers.

Miami International Boat Show

The 1953 Miami International Boat Show, the twelfth in the history of this boating exposition will be held at Dinner Key Auditorium, Feb. 20 through Feb. 25. Along with the 200 boats expected to be shown this year will be the very latest in marine diesel engines. Numerous design advances now in production by General Motors, Detroit Diesel, Chrysler, Enterprise, Caterpillar, Cummins Diesel, Gray and Nordberg will make their appearance at the Miami event.

The Miami International Boat Show, which in 1937 was housed in a tent on Biscayne Blvd., now occupies the whole of the 94,000 square feet of the Dinner Key Auditorium. Thirty-two thousand visitors from all parts of the world paid to view the 1952 spectacle and a much larger attendance is expected for the 1953 show. This show is strictly a marine exhibit, operated by men in the marine and boating field. It is a non-profit organization, sponsored by the Miami Chamber of Commerce. President of the organization is Thomas L. Phillips, vice-president, Harry Santana, treasurer, John Hanafourde, and J. Frank Knorr, secretary. Members of the board of governors other than the officers are L. Fletcher Proctor, Allen Matthews, Lewis J. Hewes III, Arthur Merrill, Capt. Jack Manson and John B. Huglen. Peggy Leyshon is executive director.

Dura-Bond Representative

Dura-Bond Engine Parts Company, Palo Alto, California, has announced the appointment of the Herman A. Shields Company, P.O. Box 1266, Meridian, Mississippi, to represent Dura-Bond in Alabama, Mississippi and Tennessee. Additional warehouses have also been announced, according to Dura-Bond sales manager, Matt Korshin. New warehouses include the House of Peaslee, 250 Brighton Avenue, Boston, Mass.; and Ahlberg Bearing Company, 1362 Spring Street, N.W., Atlanta, Georgia.

Will Be Over 90% Dieselized

The Pennsylvania Railroad lays claim to being the country's largest operator of rail diesels. In all, \$311.8-millions worth of diesel equipment, 978 switchers and 316 road engines are being used. After delivery of another 45 diesel switchers which have been ordered, the road will be handling approximately 91.1% of all road and switching operations with diesel.

Unique Drilling Equipment



The removal of strips from concrete pavements to reach underlying utility lines has been greatly simplified by the R. L. Coosaet Construction Company, of Dearborn, Michigan, through the use of a new and unique arrangement of drilling equipment. In this arrangement six drills, one foot apart, are mounted on a small wheel-type tractor to which a portable air compressor is hitched. The equipment moves down the pavement as one unit and, according to the company, drills the necessary holes in one-half the time required by other methods. Holes six inches apart are drilled by advancing the equipment six inches on one move and five and one-half feet on the next. The job is completed by a hydraulic hammer and a backhoe which follow the drilling equipment.

Besides getting the job done faster and thereby reducing inconvenience and annoyance to traffic and residents on the thoroughfare, the company also reports substantial savings in labor costs. Only one man is required to operate the equipment. Also because holes are consistently drilled six inches apart, ragged breaks in the pavement, which often cause damage to curbing, are largely eliminated. On a 17 miles job involving a 30-in. high pressure gas line recently completed in the Detroit area, the company reported increased efficiency and further reductions in drilling time through the use of an Ingersoll-Rand Rotary Compressor powered by a General Motors two-cycle Diesel engine. Although the output of this compressor is a full 600 cubic feet per minute it took up little space in the street and was easily maneuvered due to its compactness and comparatively low weight. This compressor, by maintaining a constant pressure of 95 pounds, reduced the time required to drill six holes simultaneously to only one and one-half minutes. (This drilling was through 11-inch paving consisting of eight inches of concrete and three inches of asphalt.)

The Coosaet Company is one of the leading contractors in the Midwest engaged in laying and servicing pipe lines. Mr. R. L. Coosaet founded the company in Detroit in 1922 and is now assisted by his son A. H. Coosaet in the management of the business.

FEBRUARY 1953



In romantic, historic Taos, New Mexico trouble-free power service is vitally important. For that reason the Kit Carson REA plant uses three Nugent Duplex Fuel Oil Filters to protect and prolong the life of its three 960 H.P. Diesel Engines. These heavy-duty diesels generate power for all of Taos County, part of Colfax and Arriba and parts of southern Colorado. A break-down in the system would affect 24,000 people including a group of Taos Citizens who drive to work each day at the Los Alamos Atomic Research Center 60 miles away.



Above: Nugent Duplex Filter—the type used to filter fuel oil for the Kit Carson REA plant, Taos, New Mexico

Wherever engines must give long dependable service, Nugent filtering provides the type of protection that is essential. Offering more effective filtering at lower cost, Nugent filters are available in a complete range of sizes and types to meet every need. They utilize inexpensive bag-type cartridges having 20 times the filtering area of other filters of comparable size.

Write for full data, outlining your filtering requirements.



Wm. W. Nugent & Co., Inc.
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OIL FILTERS, OILING AND FILTERING SYSTEMS, TELESCOPIC OILERS, OILING DEVICES, SIGHT FEED VALVES, FLOW INDICATORS
Representatives in: Boston • Cincinnati • Dallas • Denver • Detroit • Los Angeles • Minneapolis • New Orleans • New York • Philadelphia • Portland, Ore. • San Francisco • Seattle • St. Louis • Tulsa • Washington, D.C. • Wichita, Kan. • Youngstown, Ohio

Two New Products

The John S. Barnes Corporation has introduced two new products. They are a compact motor pump and a single solenoid 4-way valve. The pump is a complete, compact unit, the Barnes Constant-Flo rotary gear pump. It is designed for fluid transfer, lubrication, power tools and similar applications. The complete line is available from 1/4 hp. to 1 1/2 hp., with a pump capacity ranging from 60 to 360 gallons per hour. The unit has a high efficiency rating.

The valve (W-840-BA-C) is a single solenoid 4-way unit, manifold mounted for continuous duty. It has a maximum flow of 3 1/2 gallons per minute,

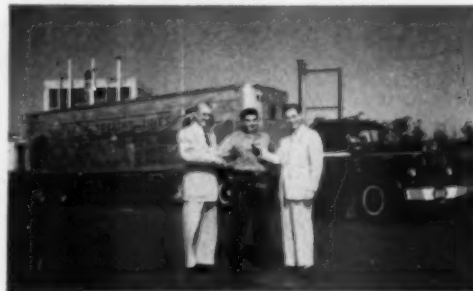
and a maximum pressure of 1,000 psi. It is extremely compact and conforms to J.I.C. Code requirements. For detailed information write to John S. Barnes Corporation, 129 Walnut St., Rockford, Illinois.

Names N. Y. Sales Manager

Mr. Richard T. Patriquin has been appointed New York sales manager for the Pennsylvania Flexible Metallic Tubing Company, Philadelphia, manufacturers of Penflex metal hose products. Mr. Patriquin takes over his new duties with a wealth of experience gained during a number of years with Penflex. He started with the company as a salesman in the Philadelphia territory and, prior to his re-

cent appointment as New York sales manager, was field representative for Mr. William Townsend, vice president. Mr. Patriquin is equipped to offer assistance on the flexible tubing problems of manufacturers in the New York area.

Sets Low Maintenance Cost Record



Left to right: Mitchell B. Howe, president of Navajo Freight Lines; John Borgogno, lease operator; and Peter Davis, vice-president.

John Borgogno, lease operator for Navajo Freight Lines of Los Angeles has established a remarkable record for low maintenance costs in the operation of a heavy duty diesel truck over a period of the past six years. The driver was recently interviewed by Mr. Al Ives, Navajo's operations supervisor. Mr. Borgogno attributed the low maintenance costs to several practices. He stated that he changed transmission grease every 30,000 miles and the oil along with the Luberfiner pack every 3,000 miles. A soluble oil is used in the radiator which keeps rust out of the water. Checking wheels and packing is another of his cost-saving practices.

Keeping the rpm.'s between 1900 and 2000, usually above 1750, has been found to be the most efficient for his equipment. At any stop he lets the engine run a while and revs it up a little to get the water circulating before turning it off. This "seems to give the valves a chance to cool . . . keeps from having warped valves and possibly from burning the rubbers on the sleeves." On the road, he tries to stop about every 50 miles to check over the equipment and permit the tires to cool.

John Borgogno drives a 1946 Kenworth with a 200 hp. Cummins "NH" engine. It is a single drive, 3-axle job weighing 18,000 pounds with a fuel capacity of 120 gallons. He has used Union Oil Company's T5X since the truck was new, and Union's All-Purpose 140 in both the main and auxiliary transmissions all year round. The rear end is a U200 Timken. Both the main and auxiliary transmissions are Spicer Brown-Lipe. Last month, Mr. Borgogno passed his millionth mile. Yet he has had no repairs other than frame overhauls.

Taylor Dynamometer Representative

Frank R. Wilson, formerly vice-president of Taylor Dynamometer and Machine Company of Milwaukee, Wisconsin, is now representing that company in Texas, Louisiana and Oklahoma. He is operating under the name of Wilson-Toler and Company, Inc., at 4101 San Jacinto St., Houston 4, Texas. Mr. Wilson has had a long association with Taylor and brings his extensive experience to the territory he will cover.



WHO PIONEERED FULL-FLOW FILTRATION?

WINSLOW,
OF COURSE

WHO SAID IT WOULDN'T WORK?

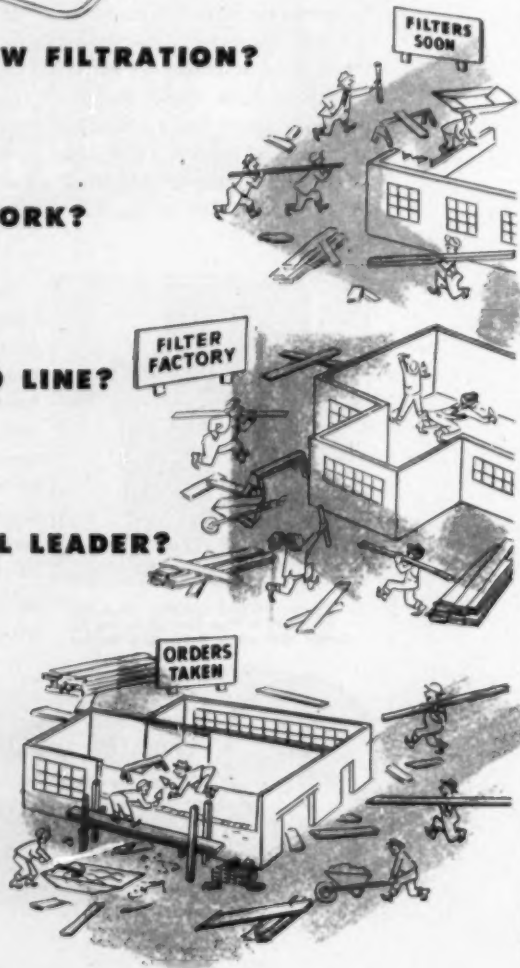
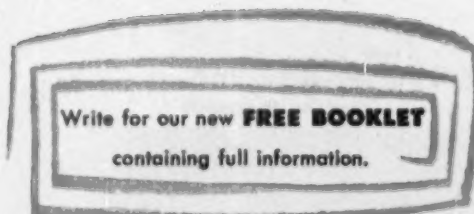
SEVERAL
COMPETITORS

WHO IS NOW FALLING INTO LINE?

THOSE SAME
COMPETITORS

WHO IS STILL THE NATURAL LEADER?

WINSLOW, OF COURSE



WINSLOW FILTERS

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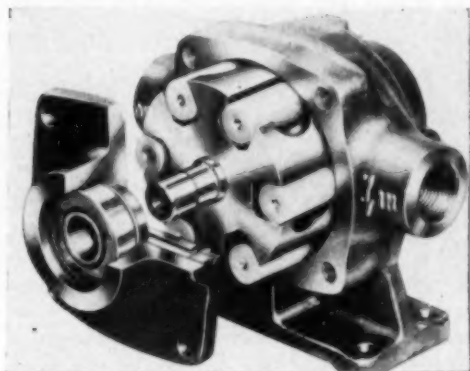
Executive Vice-President



James D. Abeles

Appointment of James D. Abeles as executive vice-president of Purolator Products, Inc., Rahway, N. J., oil filter manufacturers, was announced by President Ralph R. Layte. The appointment became effective Jan. 1. A resident of Mendham, N. J., Mr. Abeles was general manager of the company. Since joining Purolator in 1940, he has filled many positions including that of assistant to the president, equipment sales manager, assistant works manager, assistant plant superintendent, quality manager, and cost reduction engineer. He attended Stevens Institute of Technology and Massachusetts Institute of Technology.

New Pump



An 800 rpm. roller-type pump designed for belt and pulley or direct drive operation on electric motors or gas engines has been developed by Hypro Engineering, Inc., Minneapolis, Minn., pump manufacturers. Design of the product followed a demand for the Hypro model 750 heavy duty pump; the new pump is a "junior" model of the Hypro 750 and utilizes the same design at lower capacities, selling at a lower price. Named the 6000 series, the new pump is specially adapted to handle wettable powder mixtures as well as emulsified solutions. It is recommended by the manufacturer for a wide variety of spraying and transfer jobs, including weed spraying, livestock spraying, insect control and special industrial uses. The unit is instantly self-priming, will deliver approximately 12.5 gallons per minute open discharge at 800 rpm. with recommended pressures to 200 lbs.

It features "Ni-Resist" case and rotor with tough, resistant nylon rollers for positive liquid displacement and long life. Permanently lubricated ball bearings and stainless steel shaft insure smooth, continuous operation under heavy usage. The Hypro 6000 is also available in cast iron at lower cost than the "Ni-Resist" model. The pump has 3/4-in. pipe connections and can be mounted directly on a truck or tractor PTO shaft; it is furnished with base plates and solid shaft for gas engine and belt and pulley drive. For PTO use, sleeves and hub adapters are available in various shaft sizes. Pump weight is only 10 1/2 lbs. For literature and price information, write Dept. KP, Hypro Engineering, Inc., 404 No. Washington Ave., Minneapolis 1, Minn.

Completes Dieselization Program

The completion of the dieselization program of the Rock Island Lines in its 100th year of operations was announced by J. D. Farrington, president. Mr. Farrington said the railroad is the first major carrier to achieve this goal. The program was completed with the recent delivery of 10 General Motors general purpose 1,500 horsepower road units, which means that all mainline and branch operations—both freight and passenger—are equipped with the diesel-electric power. In all, 30 engines were received in November and December.

The 10 engines cost \$1,550,000, or an average of more than \$150,000 each. They are being placed

in freight service. The passenger operations other than a few suburban runs have been dieselized for nearly a year. The dieselization program was started on the Rock Island in 1937, when the first of the famous streamlined Rocket trains went into service between Chicago and Peoria. This was a major part of the rehabilitation program of Mr. Farrington, who had been brought in a year earlier by the management as chief operating officer to bring the railroad out of chaos. The diesel program continued at a fast pace until the war. After that conflict, the company again placed heavy orders. The company now has 502 units of diesel electric power, which includes 89 units for road passenger operations; 255 for freight, and 158 yard switchers. These make up 414 separate locomotives.

The World's largest manufacturers of Fuel Injection Equipment For Diesel Engines

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President of Montreal Locomotive Works

The board of directors of Montreal Locomotive Works, Limited, elected Perry T. Egbert president at a recent meeting. Duncan W. Fraser, retiring president, will continue to serve as chairman of the board and William G. Miller will remain as executive vice president. Mr. Egbert has been a director of Montreal Locomotive since 1950. He is also president of American Locomotive Company, Montreal Locomotive's U. S. affiliate, having served that company in production, sales and engineering capacities since 1920. "Expansion of Montreal Locomotive's production in new industrial fields, as well as continued output of diesel locomotives for Canadian and foreign railways will be the con-

tinuing policy of the company," Mr. Egbert stated. "Montreal Locomotive's program of diversification, initiated this year under the aggressive direction of Mr. Miller, will be intensified."

Mr. Egbert was a pioneer in promoting the use of diesel-electric locomotives on U. S. railways. Known for his vigor and enthusiasm, he was in charge of American Locomotive's successful conversion from steam to diesel-electric locomotive production during the post-war years. His interest in the possibilities of dieselization dates back to 1929, when he was placed in charge of development of a new diesel engine designed especially for railway use. In 1934, Mr. Egbert was appointed in charge of diesel locomotive sales and became well known in

railway circles in both Canada and the U. S. He was appointed a vice president of American Locomotive in 1944 and was elected president on December 1, 1952.

Authority on Supercharging



Left to right: John Fulleman, Dr. Alfred Buchi and Ralph Boyer.

Dr. Alfred Buchi, head of Buchi Syndicate in Switzerland, discusses complex phases of supercharging with old acquaintances Ralph Boyer (right) and John Fulleman (left) at The Cooper-Bessemer Corporation plant in Mount Vernon, Ohio. Mr. Boyer is vice president and chief engineer at Cooper-Bessemer. Mr. Fulleman, presently designer of turbochargers for Cooper-Bessemer, was for many years assistant to Dr. Buchi. Dr. Buchi first applied the principle of the turbocharger to European diesels in 1925. In 1934, he and Ralph Boyer worked on the first application of turbocharging in the United States on a Cooper-Bessemer engine. Cooper-Bessemer is one of the few engine building companies in the United States that has its own engineering facilities for adapting turbochargers.

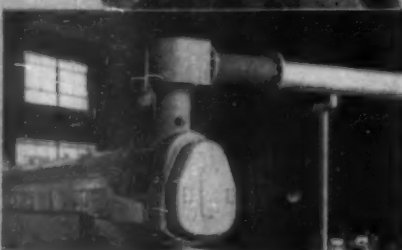
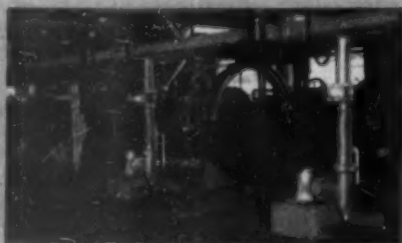
District Sales Manager



R. A. Johnson

L. A. Dixon, Jr., vice-president, Meter and Valve Division, Rockwell Manufacturing Company, has announced the appointment of R. A. Johnson as Atlanta District sales manager of Rockwell Manufacturing Company. Mr. Johnson will be responsible for the coordination of all Meter and Valve Division sales in the Atlanta district which covers southeastern United States. He will report directly to J. W. Northcutt, the regional manager who is responsible for the southeastern territory from Virginia to Louisiana. A graduate of the University of Pittsburgh, Mr. Johnson joined Rockwell in 1939 and became a sales engineer in the Atlanta District, working in North Carolina and Virginia for over five years. In 1951, he was made assistant sales manager of Liquefied Petroleum Gas Products and held that position until his recent appointment. He holds memberships in the American Gas Association, the Mid-Southeastern Gas Association and the Liquefied Petroleum Gas Association.

Large Diameter CMH REX-WELD CORRUGATED FLEXIBLE METAL HOSE

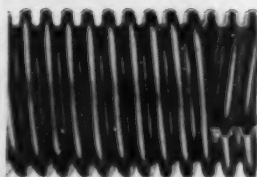


the answer to motion control for:

Diesel Engine Air Intake and Exhaust Lines • Tank Settling Connections • Safety Valve Vent Piping • Compressor Vibration Connections • Heavy Duty Loading and Unloading • And Many Other Services

Wherever large diameter connections must have the flexibility to absorb vibration or expansion and contraction, correct for misalignment or allow movement, and yet provide the rugged durability of metal, CMH REX-WELD Type RW-75 is the answer. REX-WELD Type RW-75 is the flexible connection that requires no packing, no periodical maintenance. All metal construction is completely gas and liquid tight.

For full information and data sheets see your local CMH distributor—look for his name in your classified telephone directory—or write direct.



CMH REX-WELD Type RW-75 is helically corrugated flexible steel hose and is made in sizes from 5" to 24" I.D., inclusive. Furnished with standard pipe nipples, couplings, fixed or floating flanges. Flanges to customer's design can also be attached. Where required RW-75 can be supplied with metal braid covering.

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Manufacturers of Convoluted and Corrugated Flexible Metal Hose in a Variety of Metals • Expansion Joints for Piping Systems • Stainless Steel and Brass Bellows • Flexible Metal Conduit and Armor • Assemblies of These Components In Canada: Canadian Metal Hose Co., Ltd., Brampton, Ontario



Flexonics identifies CMH products that have served industry for over 30 years.

General Manager



Tom E. Hughes

Tom E. Hughes was made general manager of the Cleveland Diesel Engine Division of General Motors, effective January 1, 1953, it was announced by Harlow F. Curtice, acting president of General Motors. Mr. Hughes succeeds George W. Codrington, who is retiring after 36 years of service with the corporation. Mr. Hughes, 42, has been assistant general manager of Cleveland Diesel since October, 1951. Mr. Codrington has been general manager of Cleveland Diesel since 1938 and a vice president of General Motors since January 5, 1942.

Mr. Hughes entered the employ of Cleveland Diesel in the fall of 1933 where he worked as a test engineer until 1935. In 1936, he was transferred to the engineering department. In 1937-38 he was engaged in service engineering work on the development of the diesel railroad engine. Later in 1938, he was transferred to the West Coast in the capacity of service and engineering representative for Cleveland Diesel Engine Division submarine program for the United States Navy at San Diego and the Mare Island Navy Yard in California. In 1939, he was transferred to Washington, D. C., as assistant manager of the Cleveland Diesel Washington office, and in January, 1941, he was made manager of that office, remaining there throughout the war years handling government sales. In September, 1946, he was transferred to Cleveland as general sales manager, and in October, 1951, he was made assistant general manager of Cleveland Diesel Engine Division, the position he held until now.

In Cleveland, Mr. Hughes is a member of the Westwood Country Club, the Propeller Club of the United States—Port of Cleveland, and the Cleveland Chamber of Commerce. In Washington, he belongs to the Congressional Country Club, and the American Society of Naval Engineers. In New York, he is a member of the Whitehall Club, and the Society of Naval Architects and Marine Engineers. Mr. Hughes is also a member of the social fraternity of Sigma Alpha Epsilon, and the engineering fraternity of Theta Tau. Mr. Hughes is a Thirty-Second Degree Mason. Mr. Hughes is married to Katherine Steibel of Cleveland. They have two daughters, Sandra Kay and Beverly Anne. Mr. and Mrs. Hughes reside in Rocky River, Ohio.

Multi-Million Dollar R.R. Yard

Work is scheduled to begin immediately on a new multi-million dollar Seaboard Railroad freight yard, and a huge diesel repair shop at Hamlet, N.C. Mr. E. E. Hamer, Seaboard Airline Railroad Terminal Superintendent, said work on the yard and shops, expected to be one of the largest and most modern in the country, will take from two to three years to complete. The project will cost an estimated \$9,500,000.

Last of The "Teakettles"

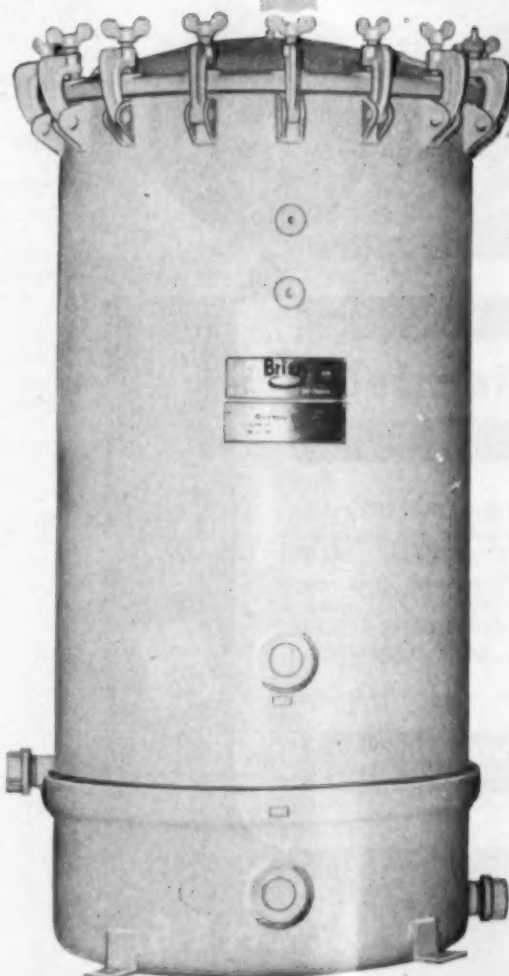
When a string of 11 steam engines headed north on the Florida East Coast Highway, pulled by old

709, the iron horses headed for New Smyrna Beach where they'll probably be sold for scrap. Those dirty, noisy engines to the public are a thing of the past and in their place are 15 brand new red and yellow diesel locomotives, and 8 more are due to be delivered real soon. All together the F.E.C. now has 64 freight and passenger diesels doing the work that was formerly handled by 300 steam engines.

YOUR COPY OF DIESEL ENGINE CATALOG in its seventeenth completely re-edited, revised and expanded edition is now available. An invaluable aid to design engineers and buyers, it incorporates the latest diesel engine specifications and descriptions. Order your copy of this limited edition now. Profusely illustrated. \$10.00. Mail checks to DIESEL PROGRESS, 816 North La Cienega Blvd., Los Angeles 46, California.

AGAIN — IT'S BRIGGS

*On the new **STERLING** diesel—featured in this issue*



... and with good reason. All over the world, on land, sea, and in the air you'll find Briggs delivering peak filtration.

Pictured here is one of the Briggs Model D-10-BR-SV4 lube oil filters installed with the new 8-cylinder, 4-cycle Sterling diesel.

Briggs
PIONEERS IN MODERN
OIL FILTRATION

THE BRIGGS FILTRATION CO., RIVER ROAD, WASHINGTON 16, D. C.

Florida Diesel News

By ED DENNIS

A STERLING VIKING diesel for the shrimp trawler *Gerry and Linda* model MRD B 8; Snow Nabstedt 3:1 reduction gears, sold by Diesel Marine Engineers, Jacksonville.

CUMMINS DIESEL of Florida repowered two Manitowoc model 3000 cranes with 2 Cummins model HRBIS 600 diesels and torque converters for George Auchter Co., Jacksonville.

SHELLEY TRACTOR CO. sold a D 375 Caterpillar 275 hp. for the 80 ft. *Santa Lucia* and a D

337 for the 62 ft. *Anastasia*; both have Twin Disc clutch, Snow Nabstedt reduction gears; Tampa is their home port.

5 PATROL GUNBOATS are being built up at St. Marys, Ga. for the U. S. Navy by the MacDonell Boat Works; they are of the 110 ft. PGM class, each powered with 2 General Motors diesels model 16-184A, no clutches but controllable pitch propellers, the reduction gears are integral with the engines, two 20 kw. 120 volt dc. generators with GM 2-71 diesels for the auxiliary light panel.

3 MORE Florida shrimp trawlers are just off the ways at Diesel Engine Sales, St. Augustine. The *Fair Tide* with a D 337 Cat for Fair Shrimp Co.,

Tampa, the *Celestino Arias* with a GM 6-71 for Dan Arias, Tampa, and the *Golden Duchess* with a D 13000 Cat for Frank Haneburger of Ft. Myers; all are Tams designed and equipped with Goulds and Barnes pumps and Columbian propellers.

FOR CAMAGUEY, Cuba—2 Sterling diesels with two 75 kva. Westinghouse generators for power in an iron mine; and two 240 hp. Buckeye diesels with General Electric generators for San Rita Cuba, from Auto Marine Engineers of Miami.

FROM PENINSULAR Armature Works for Eastern Airlines main overhaul base, a quad of General Motors 6-71 diesels connected to a 500 kw. General Electric 2300 volt generator for emergency power during hurricanes and power failures.

AT NICHOLS another pair of model LRI 600 Cummins diesels for the Virginia-Carolina Chemical Co. to repower the second 65 ton Whitcomb locomotive. Specifications of this second successful repower job are: Thomas Flexible couplings, Westinghouse generators and Woodward governors.

AT THE Charles Toppino rock pit, Key West, was an Allis Chalmers dozer with a GM 6-71 diesel and an Allison torque converter, an International Harvester powered Gallion scraper and a P and H Harnischfeger diesel shovel with a Rockford power take-off. A GM diesel trailer is used to haul cement from Miami (300 miles round trip) 8 times a week with 460 bags each trip.

THE *Karl* is the latest shrimp trawler to be berthed at Marathon on the Florida Keys, powered with a Caterpillar D 13000 diesel, Snow Nabstedt reduction gears, Twin Disc clutch, Jabsco pumps, Willard batteries and a 3000 watt Onan diesel generating set.

FROM General Engine and Equipment, Tampa—a General Motors 6-71 diesel and a GM clutch to repower the saw mill of Hackney Lumber Co.

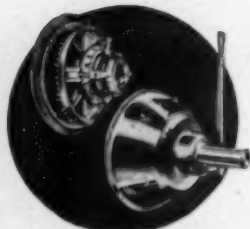
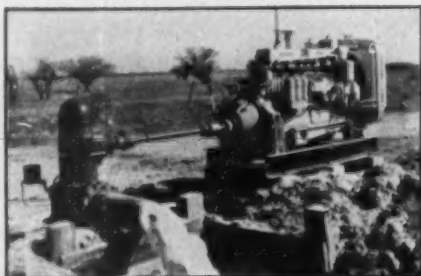
BUILT in the Bahama Islands and repowered in Miami the *Seven Seas* with 2 GM diesels, Borg-Warner clutches, 2:1 reduction gears.

A MURPHY diesel for *Miss Sarris*, a 55 ft. shrimp trawler owned by Clinton Guidry, model M-125 supplied by Byrne & Rice of New Orleans. Twin Disc clutch and marine gear, 3:1 ratio, Columbian 3 blade 45x38 propeller; sister trawlers are the *Princess Pat* and *Minnie M.*

PETTER SMALL Engine Div. of Brush Abco Inc. has appointed M. D. Moody and Sons Inc., 4652 Phillips Highway, Jacksonville, as their agents for sales and service on the Petter diesel engine for the State of Florida.

YOUR COPY OF DIESEL ENGINE CATALOG in its seventeenth completely re-edited, revised and expanded edition is now available. An invaluable aid to design engineers and buyers, it incorporates the latest diesel engine specifications and descriptions. Order your copy of this limited edition now. Profusely illustrated. \$10.00. Mail checks to DIESEL PROGRESS, 816 North La Cienega Blvd., Los Angeles 46, California.

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For day-in-and-day-out pumping, the CATERPILLAR Diesel Engine does the job dependably and economically. Long, hard operations are its "meat". And ROCKFORD POWER TAKE-OFFS transmit its power to the pumping unit efficiently. Let ROCKFORD clutch engineers work with your product development department to design similarly reliable power transmission controls for your equipment.

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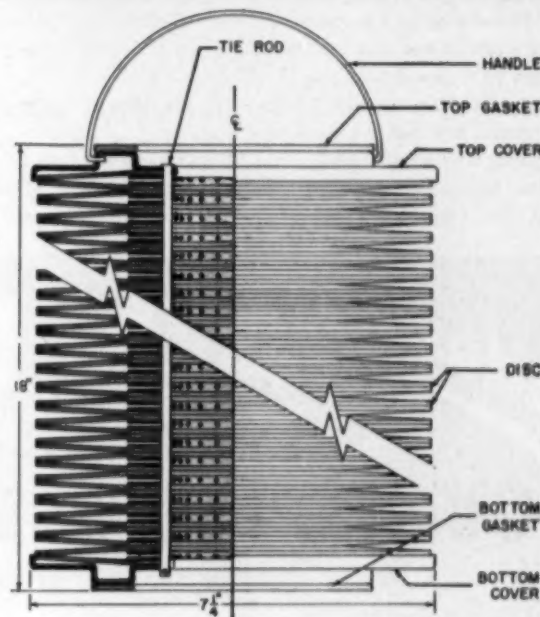
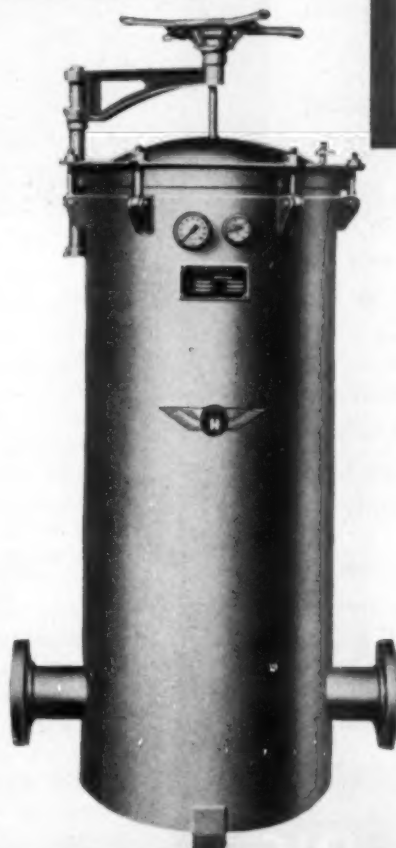
in the **HOFFMAN** *FLOmaster* FULL-FLOW CARTRIDGE FILTER

UNIQUE, QUICK-
OPENING COVER HAS
66% FEWER BOLTS
— SPEEDS
CHANGES



Easily removed swing bolts secure Flomaster cover to the tank. Neoprene gasket securely held by retaining groove in the head — no loose gasket to manipulate.

Hand wheel raises cover and support swings to a 45° angle with least effort... cartridges thus fully exposed for easy replacement.



45 SQ. FT. OF FILTERING AREA are provided by the ingenious and exclusive design of each Flomaster 7 x 18 throwaway cartridge. This higher dirt-holding capacity means longer cartridge life for full-flow performance. As shown above, 135 disc assemblies comprise the filter element. Each assembly consists of two resin-treated paper discs and a separator. Passage ways in the separator allow full-flow of oil to the center manifold after passing through the disc. Each disc is sealed electronically at its periphery with a water and oil insoluble adhesive.

For full protection of bearing surfaces you want full-flow filtration of the main lubricating oil stream. With that requirement in mind, Hoffman — builder of industry's most complete line of filtration equipment — has developed the Flomaster.

In ten sizes, for full-flow rates from 75 to 900 g.p.m., the Flomaster cartridge filter removes abrasive particles down to 20 micron size or smaller. Design and construction afford minimum pressure drop — only 5 p.s.i. with 150 S.S.U. oil. Inlet and outlet connections are diametrically opposite on the same center line to permit in-line piping. Oil inlet is in center of tank for unobstructed flow through the unit.

Write for New FLOmaster Bulletin A-873 and for Literature On These Other HOFFMAN Diesel Filters.

OIL CONDITIONERS
25 to 600 g.p.h.
Bulletin A-667

CARTRIDGE FILTERS
7 x 18 size: Bulletin A-888
11 x 18 size: Bulletin A-649

DEHYDRATORS
Remove Fuel, Water, Air
Bulletin A-668

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U. S. HOFFMAN MACHINERY CORPORATION
337 MADISON STREET, STROUVER & NEW YORK

Orders Commuter Cars

Twenty new commuter cars on the Long Island Rail Road will utilize more than \$500,000 worth of Westinghouse Electric Corporation electrical equipment. The new cars are a part of the current modernization policy of the nation's largest daily commuter line. The cars, to be built by the Pullman Standard Car Manufacturing Company, will be of the single-deck type and will seat 128 passengers. They will weigh 63 tons unloaded. Each car will have two 250-hp. traction motors, battery-operated electropneumatic unit switch control, and five Railvane ventilating fans. Both heating equipment and the axiflow fan system will be thermostatically controlled. The electric motors will be

built at the Westinghouse plant at East Pittsburgh, Pa., while the fans will be built at the firm's Sturtevant Division, Hyde Park, Mass. The motors will be duplicates of those now in operation on double-deck cars on the Long Island. Other equipment supplied by Westinghouse for the cars includes control boxes, line switches, auxiliary main circuit breakers, and an ultra modern system of car ventilation. The cars are expected to be in operation within the next two years.

Nordberg Bulletin

Construction, operation and application features of Nordberg 9-in. and 13-in. bore diesel dual-fuel and spark-fired gas engines are contained in a new

12-page, three color bulletin published by Nordberg Manufacturing Company, Milwaukee 1, Wisconsin. Bulletin 205 describes the pressure lubrication, high velocity cooling, efficient fuel systems and other pertinent design characteristics of these Nordberg four-cycle engines. A three color schematic cross section of the engine points out these features and shows clearly the lubricating oil and cooling water systems used. The sturdy construction of these engines is also discussed and the principal parts are illustrated.

The engines as described in Bulletin 205 are offered in non-supercharged, supercharged, intercooled-supercharged and Supairthermal types to meet the operating requirements of any specific application. Typical installation pictures show these various applications. A section devoted to engine performance illustrates the design simplicity of the turbocharger and also presents an indicator diagram showing the increased efficiency of the Nordberg Supairthermal engine. Bulletin 205 also presents in table form brake horsepower ratings of the various size 9-in. and 13-in. engines together with weights, standard equipment listing and outline dimension drawings. Bulletin 205 is available, free upon request.

Rock Core for Kenny Dam



22-ton "Euc" dumps crushed stone along core of Kenny Dam.

Nearing completion, the rock core of Kenny Dam in British Columbia is being washed down by high pressure jets of water as the fill is placed. Operating at 75 psi., the jets pour out approximately 2 cu. yds. of water for every yard of rock. They are mounted on tractor driven monitors. More than 2,000,000 yds. of rock have been placed in six months by a fleet of 31 Euclid Rear-Dump trucks of 15 and 22 ton capacity. Working two 10 hour shifts, the trucks averaged 17,000 cu. yds. a day.

The dam, key to the Alcan power development of the Aluminum Co. of Canada, will rise 317 feet above Nechako River canyon floor and be 1500 feet long, reversing the river and sending the flow from a chain of lakes to a power house 110 miles to the west. The dam is being built by Mannix Ltd., subsidiary of Morrison-Knudsen, Inc., contractors for the power development phase of the project.

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Introducing A NEW SYNCHRO-START OVERSPEED GOVERNOR For Tachometer Drive Take-off



This Governor can easily be mounted at any location and driven by a standard S. A. E. Heavy Duty Flexible Shaft connected to the tachometer take-off.

It has a single pole double-throw switch enclosed in the cap for either Automatic re-set (Model GFA) or Manual re-set (Model GFM) with contact capacity of 10A at 125V non-inductive load. The rotating parts run in Sealed Ball Bearings lubricated for life and the entire unit is weather-proof.


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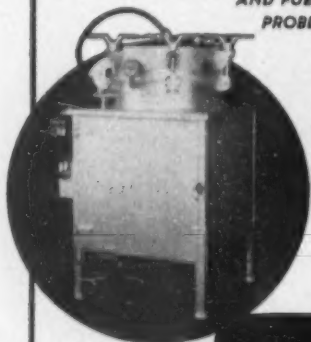
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Bay Area Diesel News

By BRUCE WADMAN

SAN FRANCISCO, Jan. 15: For the Petaluma Co-operative Hatchery, located in the heart of the chicken center of the world, a 100-kw. diesel stand-by generator set has been installed in case the power keeping the incubators warm fails. The GE generator is driven by a 150-hp. Buda diesel, with automatic controls from King-Knight Co.

THREE 600-kw. generator sets have been supplied recently for the Navy transmitter plant in Monogram, Va. Each set consists of a Westinghouse generator, manufactured in the new Westinghouse plant in Sunnyvale, driven by a P8, supercharged Union diesel developing 900-hp. at 514 rpm.

A NEW harvester has been bought by the Woodland Cooperative Farmers Association. Two 4-71, 100-hp. GM diesels will power the harvester, one engine being used for propulsion and the other for operating the harvesting mechanism.

THE EARTH-MOVING phase of the construction of Lexington Dam, located in the Santa Cruz Mts. above Los Gatos, has recently been completed, and diesel equipment has been instrumental in finishing this rugged job satisfactorily and on time. This construction job has climaxed a year's successful trial of a new piece of earth-moving equipment. The Cat DW-20 tractor-scraper combination, powered by a 275-hp. Cat diesel, was introduced a year ago, and since then forty-six of these new design, more powerful tractor-scrappers have been sold in the Bay Area. Guy F. Atkinson Co. has had eight of the DW-20's working at Lexington Dam in the construction of its earthfill structure.

THE NEW GM welterweight 3-71 diesel truck engine, recently introduced in the Bay Area, has already found particular application in some phases of trucking. It has proven itself very successful in trucks and trailers used to transport automobiles. Five engines have been sold to truckers for this use and they have produced great savings in time and fuel costs. These engines have also found adaptability in medium-duty dump trucks. This 3 cylinder, 2 cycle, 110-hp. diesel makes for easy change-over from existing gasoline engine to diesel drive.

THE Utah Construction Co. has repowered three Euclid dump trucks with model NHBIS-600 Cummins diesels developing 275-hp. These trucks will be shipped to an overseas construction job.

THE Crowley Tug Boat Co. has just put two new tugs into operation in the Bay. These vessels are 90-ft. long and are driven directly through reduction gears by GM 567-A, 12 cylinder, 900-hp. Cleveland diesels.

A NEW twin-screw tug is being built at Pacific Coast Engineering Co. in Oakland for the San Diego Marine Construction Co. When the hull is finished, the tug will be towed down to San Diego for engine installation. Two GM diesels about three years will be transferred from the tanker *San Diego* to this new tug.

LAST MONTH I had a look at the biggest milling machine in the West. Enterprise Engine and Machinery Co. has recently put into operation an Ingersoll 4 head planer-mill with a 28-ft. bed. The rest of the working area includes a 76-in. width and an 84-in. height. This gigantic milling machine can machine three sides of an engine block or base at one time. Roughing and finishing operations are performed by this machine at a saving all the way through of 50% to 75% over old methods.

AN INTERESTING method of garbage disposal has been introduced in Sonoma County. The use of a sanitary landfill operation has been tried and has proven to be successful in disposing of garbage. In this method pits are dug and garbage trucks drop their daily loads into these pits. Twice weekly a Cat D4 tractor with an angling bulldozer blade covers the rubbish with a 6-in. layer of dirt. The first pit was opened in July, 1952. Before this, garbage was put into an open dump off a canyon.

THE Cleveland Diesel Engine Div. of GM is moving to a new address on or about January 15. Their new location will be at 870 Harrison St. in San Francisco.

PACIFIC Coast Aggregates, with plants scattered throughout the Bay Area, have recently put four Allis-Chalmers diesel tractors into operation in three of their plant locations. There is an HD-20G four-yard loader tractor-shovel at Centerville; three HD-20 tractors with bulldozers, one at Elliott and two at Brisbane, complete the list of equipment. These rugged tractors are all equipped with GM 6-110 diesels developing 175-hp. through Twin Disc torque converters.

The "Sea Duke"



The Pacific Towboat Company of Everett, Washington recently repowered the 64 foot *Sea Duke* with a General Motors 6-110 diesel engine with hydraulic reverse gear furnished by the Evans Engine and Equipment Company, Inc., of Seattle. The new engine turns a 54 in. x 35 in. three-blade propeller through 4.5 x 1 reduction. The craft is used on a scow run on Puget Sound between Everett and Port Townsend making four or five round trips per week. She has a beam of 15 feet and a draft of seven feet.

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DIESEL PROGRESS

Factory Branch Managers



L. M. Williams



J. S. Chisholm

Appointment of L. M. Williams, J. S. Chisholm, T. O. Robertson and A. R. Walker as factory branch managers reporting to the general manager was announced by N. C. Dezendorf, vice president of General Motors and general manager of Electro-Motive Division of La Grange, Illinois. Mr. Dezendorf announced that these appointments were necessitated by increased parts and rebuild business and the expansion of the facilities of the factory branches.

L. M. Williams, originally of Helper, Utah, started with Electro-Motive in 1938 as an engine tester. He successively moved to locomotive test, service engineer, parts and stores representative, sales representative, assistant rebuild sales manager and most recently rebuild sales manager in La Grange before his promotion to branch manager, Halthorpe, Maryland. Born in Pembina, North Dakota, Mr. Chisholm received his education in his home state, attending the University of North Dakota where he engaged in pre-legal studies. He joined Electro-Motive in April, 1937, as a stock clerk. Since then he has worked as stockkeeper, zone parts manager, branch service representative, branch plant superintendent and branch plant sales manager.



T. O. Robertson



A. R. Walker

Mr. Robertson, a native of Perley, Minnesota, received his education in that state. He joined Electro-Motive in June, 1926. His activities with Electro-Motive includes service instructor, service engineer, district engineer, regional service manager at San Francisco and sales manager of the Emeryville Factory Branch. Mr. Walker joined Electro-Motive in January, 1946, as a field engineer. Formerly with American Car and Foundry, he came to Electro-Motive following his service during World War II. He has worked as district sales representative and regional service manager in the Chicago region before his assignment as branch sales manager for the factory branch at Jacksonville, Florida. His new responsibility as branch manager includes both sales and manufacturing.

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Packing Catalog



The PC-102, a new, extensively revised 20 page catalog covering all Palmetto Packings has just been published by Greene, Tweed & Co. of North Wales, Pennsylvania, producers of mechanical packings. It is designed to be especially useful in packing selections for maintenance purposes. Text includes details on Palmetto self-lubricating, molded, and sheet packings plus information on Palmetto Teflon, latest addition to the Palmetto line. New data, editing refinements, and continuation of the

simplified format showing application, structure and performance of each packing make the PC-102 the most comprehensive, yet easy-to-use catalog ever issued by the company. Photographs, diagrams and cutaway views highlight the text and an overall packing application chart enables rapid, accurate finding of the packing suited to the service condition. Convenient ordering tables include packing dimensions and full packaging information. Copies can be obtained by writing to Sales Manager, Greene, Tweed & Co., North Wales, Pa.

To Open New Plant

First steel on a new plant for Caterpillar Tractor Co. at York, Pa., was erected October 23. After

production starts this year, the facilities covering more than 400,000 square feet of floor space will enable the Company to utilize Eastern steel sources and better supply replacement parts to Eastern and European outlets. The York plant marks an additional expansion for Caterpillar. In addition to its main plant at Peoria, Caterpillar built extensive facilities at Joliet, Ill., in 1950, and has a factory at San Leandro, California.

Included on the 200-acre site at York will be a manufacturing plant of approximately 370,000 square feet, heating plant and office building. In addition, the Company recently executed a long-term lease on a 300,000 square-foot, one-story warehouse and parts processing plant to be located adjacent to the manufacturing site. T. R. Farley is vice president in charge of operations for Caterpillar. Consolidated Engineering Co. of Baltimore holds the general contract. Limited production is scheduled to start in May. Ultimately, about 1,000 persons will be employed on three shifts.

Eaton Parts for Diesel Engines



have a background of years of cooperation with the Diesel industry

Eaton is proud to have served as supplier to leading Diesel engine manufacturers for many years—furnishing valves, free-valves, lash adjusters, valve seat inserts, cam followers, bolts, studs, and other precision

parts. This close cooperation with the Diesel industry has given Eaton engineers a thorough understanding of the requirements of specific engines, so essential in solving valve-train and other problems.

EATON MANUFACTURING COMPANY

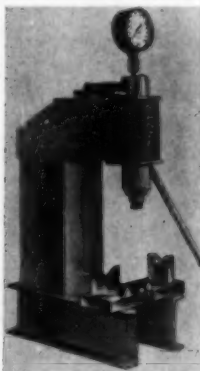
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Hydraulic Arbor Press



A new bench type arbor press has been developed by Manzel having a wide range of uses. Design tested, the 10 ton press is now in production. Press is widely usable in tool room, laboratory or machinery overhaul department, for such applications as straightening, material testing, bending, bushing or bearing removal and replacement, etc. Gauge registering in tonnage is available as optional equipment. Vee blocks and bearing plate furnished as shown. Write for brochure showing complete specifications to: Manzel, 315 Babcock Street, Buffalo 10, New York.

Expansion Joint Catalog

The recently redesigned Flexon line of expansion joints is featured in a new sixteen page illustrated two-color catalog just released by Flexonics Corporation, formerly Chicago Metal Hose Corporation. Complete specification and supporting data is given for new Flexon expansion joints, now offering increased traverse per corrugation. Also covered thoroughly in this catalog is complete specification and application information for CMH corrugated and convoluted types of flexible metal hose, including couplings, flanges, nipples, and assemblies. Installation instructions are included. For a copy of this new catalog, please write Flexonics Corporation, 1325 South Third Avenue, Maywood, Illinois, asking for catalog CMH-128.

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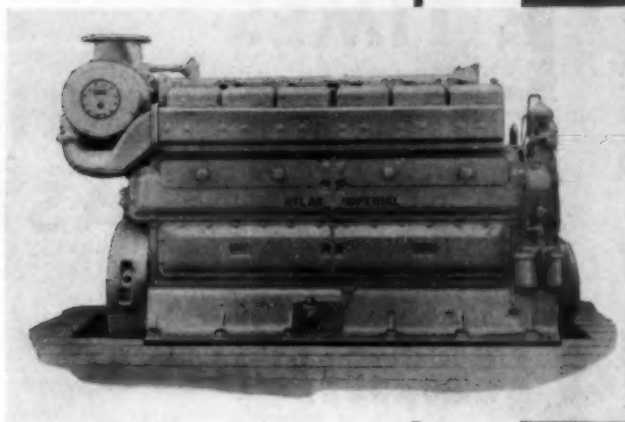
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the ATLAS MODEL 35 DIESEL

**VERSATILE
EFFICIENT
RUGGED**

100-300 Horsepower



BRIEF SPECIFICATIONS

BORE: 6½"; STROKE: 8¼"
SPEED: 900—1200 RPM

Built in 4 and 6 cylinder types.

Large fully machined crankshaft is bedded in base, providing greater service availability than suspended crankshaft.

Cams and assembly readily accessible by removal of panel from control side of engine.

Fully enclosed — pressure lubricated throughout — full flow filtration.

Precision main and connecting rod bearings.

Designed for heavy duty service, this noteworthy addition to the time tested and proven Atlas and Superior range of Diesels incorporates refinements in design and construction which assure dependable, efficient power and low cost operation and maintenance.

A THOROUGHLY MODERN POWER PLANT FOR ...

- General Industrial Power
- Water Pumping
- Electric Power Generation
- Industrial Locomotives
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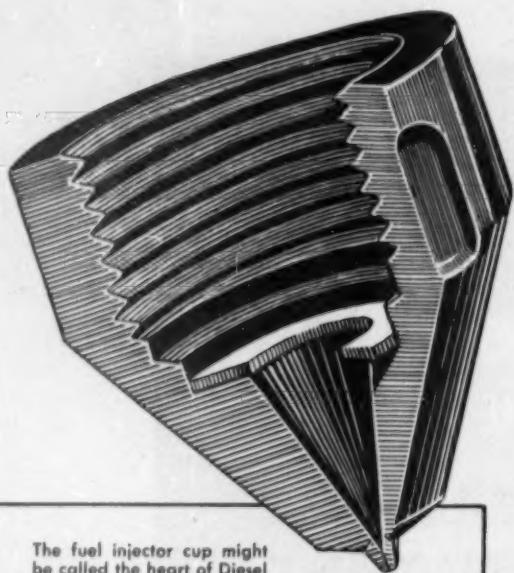
Write now for a bulletin containing detailed specifications and load-speed tables.

One further reminder—there's an Atlas or Superior Diesel for every municipal, marine, industrial or standby power requirement. Give us some general information on your power problems and we'll furnish further details.



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The fuel injector cup might be called the heart of Diesel operation. The fuel charge is driven through holes about six ten-thousandths of an inch in diameter and broken up into an evenly distributed vapor. These almost microscopic holes must be deburred and cleaned thoroughly, without disturbing their dimensions. Vapor Blast Liquid Honing is the only known method of doing this job efficiently.

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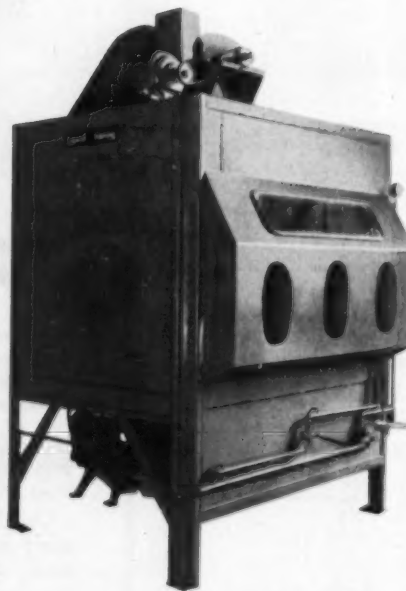
Liquid Honing*

Liquid Honing removes internal burrs on injector cups which are virtually inaccessible to conventional methods.

In addition, it produces a smoother surface for better fuel flow and minimizes the build-up of gums or carbon deposits.

Vapor Blast Liquid Honing performs this job at an unbelievably low production cost. One man, using Vapor Blast Liquid Honing, delivers as many injector cups as eight workers did in the same time, by former methods.

Vapor Blast Liquid Honing is used throughout the world as the most efficient method for all types of engine overhaul, as well as for original equipment manufacture. Machines are available in a wide range of sizes, in complete and self-contained units. They are made both in standard and custom-built models to fit your production requirements for manual or automatic operation.



Vapor Blast Model 6048
Type B20 Liquid Honing Machine



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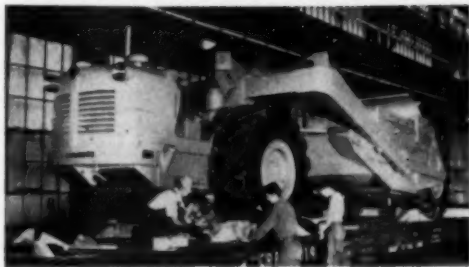
FREE PROCESSING DEMONSTRATION

Send us one of your parts to be processed and finished for your evaluation. We'll return it to you with an accurate record of the processing data as a convincing example of the efficiency of the Vapor Blast Liquid Honing process. Send us your problem today.

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First of Many



When this Model TS-300 was shipped from the Cedar Rapids, Iowa, Works it officially marked the entrance of Allis-Chalmers in the motor scraper field. The first shipment of equipment followed shortly after the acquisition of the LaPlant-Choate Manufacturing Company, Cedar Rapids. The large rubber-tired equipment is now incorporated in the A-C industrial line which includes dieselized crawler tractors, motor graders, industrial wheel tractors, and power units.

Preventive Maintenance Log Book

A preventive maintenance log book which makes it easy to record recommended service and maintenance operations on GM diesel oil field engine units, has been prepared by the Detroit Diesel Engine Division of General Motors. According to the Division, properly timed maintenance procedures carried out as indicated in the book, will assist drilling contractors and drillers materially in reducing costs and getting maximum performance and longer life out of their power equipment. The book outlines the various things to be done

on each shift as well as those required at the end of 170, 500 and 1,000 hours of engine operation. Space is furnished for convenient recording of these items when completed and for keeping a running record of hours operated, repairs made and amounts of lube and fuel oil used. Complete information on all phases of diesel engine operation including the General Motors torque converter is also provided. The log book has a grease-resistant cover and is constructed throughout to withstand the hard usage it will receive on the job. It may be obtained from Detroit Diesel distributors and dealers serving the petroleum industry.

Improved Mercury Actuated Dial Thermometer



Palmer Thermometers, Inc. of 2515 Norwood Ave., Cincinnati 12, Ohio, are now marketing a new mercury actuated dial thermometer. A feature of this thermometer is the ability to adjust the dial to any angle for readability. The dial is a full 4½ inches in diameter and printed in bold black letters. Three models are available; with rigid stem interchangeable with standard industrial thermometer separable socket, as a wall mounted dial thermometer with flexible connecting armor, and flush mounted style for panel mounting with flexible connecting armor. For further details, write to the above address for Palmer Bulletin 51-129.



How much of your engine maintenance bill is due to repair of breakdowns that could have been avoided—if you'd had advance warning?

At a fraction of that cost, Alnor Exhaust Pyrometers offer you a constant check of engine performance—advance warning of

Cylinder Overload Preignition
Scaled Jackets Clogged Ports
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Get the best from your diesel—minimum fuel consumption per horsepower and long service uninterrupted by foreseeable breakdowns. Get constant protection of your engine, cylinder by cylinder, with an Alnor engineered Exhaust Pyrometer System.

Get Full Information—Quickly! Your nearby Alnor Diesel specialist is conveniently listed in the classified directory. Ask him to help you select the Pyrometer and thermocouple assembly designed for your engine. Or send for Bulletin 4361 with complete details of the full Alnor line of Pyrometers.

Every Diesel Deserves Alnor Protection.

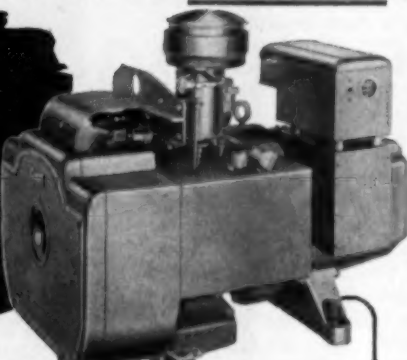


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which he can measure

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Take a good look at this New Powerhouse!

THE ONAN
"CW"
***ELECTRIC PLANT**
5,000 or 10,000 watts



LOWEST COST per kilowatt, **HIGHEST OUTPUT** per pound, **MOST COMPACT!**

For any use . . . standby, mobile, portable or stationary, the new Onan 5CW and 10CW give you top performance and value! Here, for the first time, are 5 and 10KW electric plants powered by engines designed and built by Onan exclusively for electric plant use.

Both engines are 1800 R.P.M. Weigh less and are much more compact than general-purpose engines. Two-cylinder, alternate-firing design. New vacuum air cooling. High-tension magneto ignition. Standard voltages 60-cycle A.C.

For Out-Plant
IN DESIGN AND ENGINEERING

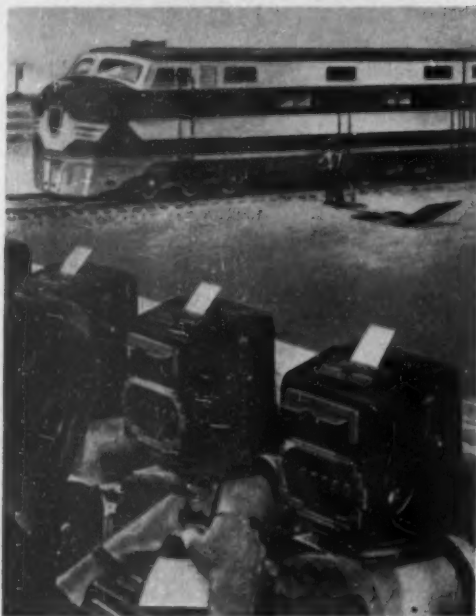
- Twin-cylinder opposed engines
- Aluminum alloy cylinder heads
- Extra-large bearings
- Excellent accessibility
- Pressure lubrication
- High performance generators
- Completely equipped with controls, instruments

Write for folder and specifications
D. W. ONAN & SONS INC.



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THE ROCKWELL Remote Registration System For Fueling DIESEL LOCOMOTIVES



**CUTS COSTS • STOPS LOSSES
IMPROVES ACCOUNTING**

Remote registration of fuel loaded into Diesels can offer you some startling advantages and savings. First you put the sole control over all metered outlets in the hands of one supervisor. He operates from a control room overlooking the entire fueling area. No fuel can be drawn until he inserts a ticket in the proper printing register and activates the matching electric circuit. At the completion of the fill the unalterable ticket shows the exact gallonage loaded.

In addition to providing positive proof of actual deliveries, carbons of these remotely printed tickets can be used for inventory control, to verify tax payments and to form the basis for a completely mechanized accounting procedure.

HOW THIS BETTER SYSTEM WORKS

The row of office printing registers (shown in main illustration above) is electrically synchronized to standard registers on Rockwell Rotocycle meters in the fueling pits outside. Each office register is permanently interlocked to one meter register and all gallonage dispensed by that meter is accurately recorded, then printed under the direct, watchful control of the dispatcher. The entire system bears the Underwriters' Laboratory seal of approval.

WRITE FOR
BULLETIN
QG-324



ROCKWELL MANUFACTURING CO.
Pittsburgh 8, Pa.



This ticket is sealed into and printed by the remote register. It guards against human errors, doubts and losses—provides permanent indisputable records for inventory control, cost and tax accounting.

Barge Industry Plans

By CHESTER C. THOMPSON*

THE barge and towing vessel industry in 1952 improved its competitive position through advances in efficiency and augmented cargo capacity in anticipation of growing demands in 1953 for low-cost bulk transportation of commodities in mass production and mass distribution. Sixty-eight inland shipyards launched 724 towing vessels and barges during 1952. Now under construction in these yards are 303 vessels, and on order for delivery in 1953 are 778 commercial craft for river, canal and harbor operation. The new fleet launched during 1952 includes 84 tugboats, 42 towboats, 432 dry cargo barges, 145 tank barges, 21 miscellaneous barges.

Now under construction are 53 tugs, 25 towboats, 182 dry cargo barges, 33 tank barges, eight miscellaneous barges and two self-propelled barges. The shipyards have orders under firm contracts for 29 tugs, 18 towboats, 602 dry cargo barges, 112 tank barges, 14 miscellaneous barges and three self-propelled barges. Thirty-eight towboats and tugs were built during the first ten months of 1952 under American Bureau of Shipping specifications. Twenty-one of these range in horsepower from 1000 to 4800. Ten of the seventeen under 1000 horsepower were built for the Armed Forces.

One-hundred and twenty-six barges were built during the first ten months of 1952 under American

*President, The American Waterways Operators, Inc.

Bureau of Shipping specifications. Fifty-one percent of the ABS barges ranged in length from 195 to 290 feet. Integrated tows of eight tank barges having a total capacity of eight million gallons made their appearance on the inland rivers and canals in 1952 to meet the competition of the big-inch pipeline. All freight carriers suffered loss of cargo because of the 1952 steel strike, the disturbed world oil situation and the curtailment of economic cooperation shipments to foreign countries, but inland waterway transport partially overcame these traffic losses through diversion of equipment to the movement of chemicals, farm products, defense materiel and the raw materials, fuels and products of waterside industries and power plants.

Inland waterways carried a greater percentage of the total inter-city ton-miles of freight traffic in 1951 than 1950. The Board of Engineers for Rivers and Harbors, Army Corps of Engineers, will shortly publish its preliminary tabulation of the 1951 inland waterway traffic. These preliminary totals will show adjustments since the Corps' traffic estimates were made several months ago and are subject to further changes in the Annual Report of the Corps due in 1953. The preliminary totals will show 325,433,581 tons of freight moved on the inland waterways in 1951, compared with 297,696,209 tons in 1950, an increase of nearly 10 percent. In ton-miles of freight carried on the inland waterways in 1951 the Mississippi River System carried 36.7 billion, the Atlantic Coast rivers carried 10.4 billion, the Pacific Coast waterways, 4.3 billion; the Gulf Coast rivers, 1.1 billion; all canals and connecting channels, 9.5 million, other waterways, 6.6 million.

DIESELS for operating ECONOMY

The present day trend toward diesels — both for new installations and for replacements — is largely due to operating economy and dependability.

Current installation practice is to mount them on Korfund Vibro-isolators.

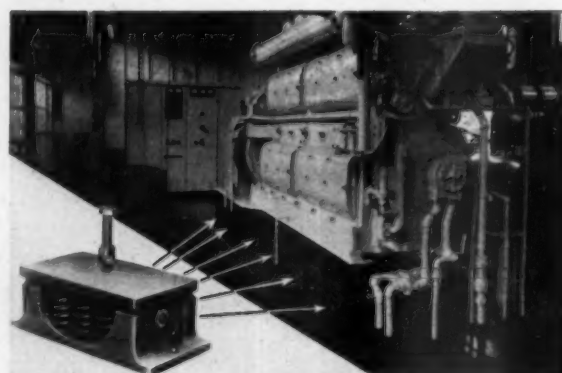
This makes it possible to install diesels anywhere with positive assurance that there will be absolutely no transmission of objectionable vibration. Additional benefits include savings from reduction of building and engine maintenance costs, and frequently the elimination of concrete foundations.

Vibration is absorbed by steel springs which provide the finest isolating medium available. Thrusts are controlled by resilient checks in the four corners.

The result is smoothed, floating operation at all speeds — in marine, mobile, or stationary installations. The cost is low. Ask for Bulletin G-104. Representatives in principal cities.

The Korfund Company, Inc.

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This Alco 975 hp. six cylinder turbocharged main generating unit installed on a mooring barge operated by U.S. Army Corps of Engineers, Memphis District, supplies power for their new dragline bank graders. The unit is mounted on Korfund vibro-isolators for smooth operation, and to prevent bearing misalignment due to hull distortion.

A Few Typical Installations:

Banger Hydro-Electric Co., Bangor, Me.	6 1425-hp. Worthington
Lenox Hill Hospital, New York	1 750-hp. Worthington
2 Park Avenue, New York	4 450-hp.; 1 750-hp. Worthington
New Yorker Hotel, New York	1 530-hp.; 1 750-hp. Busch-Sulzer
Hamam Department Store, Brooklyn	4 300-hp.; 1 180-hp.; 1 150-hp. Worthington
Macy's, New York	1 700-hp. Alco
Floyd Bennett Field, New York	1 450-hp. Fairbanks-Morse
Prudential Insurance Co., Newark, N. J.	1 740-hp. Baldwin
Lone Star Gas Co., Dallas, Texas	1 400-hp. Cooper-Bessmer (Gas)
Sun Oil Co., Marcus Hook, Pa.	4 250-hp. Ingersoll-Rand (Gas)
Cia Central Argentina De Electricidad, Buenos Aires, S. A.	1 270-hp. Sulzer; 2 540-hp.; 1 540-hp.; 1 700-hp. Dautz

KORFUND for operating SMOOTHNESS

Grading New RR Bed



8,000,000 cubic yards of dirt will be removed in grading 32 miles of new railroad bed for the Rock Island between Atlantic and Council Bluffs, Iowa. In this section near Hancock, an International TD-24 crawler tractor owned by Ace Construction Company, Omaha, pulls a loader through a windrow of surplus fill at a double track passing point.

Over 8,000,000 cubic yards of dirt have been moved in grading 32 miles of new railroad bed for the Rock Island Railroad's section of track between Atlantic and Council Bluffs, Iowa. This single-track project, with several double-track passing points, has a 24-foot top with a 20-foot flat bottom ditch, 2 feet deep on each side. Width of the right-of-way varies from 125 feet to 200 feet because of the deep cuts and fill necessary for construction of a line through this hilly section of Iowa.

For their portion of the earth moving contract, shared with Eblin Construction Company of Atlantic, the Ace Construction Company, Omaha, is using 8 International TD-24 and 2 International TD-14-A crawler tractors to bulldoze, push-load scrapers and pull 16,000 pound sheepfoot rollers over fill composed primarily of glacial clay. While construction was slowed down during the early stages of the contract when uncovered springs and rain turned the roadbed into a mass of mud, ideal

working weather has provided the Ace crew with an opportunity to make up the lost time.

'One Man' Diesel Jack



The Joyce-Cridland Company is now marketing their latest addition of a new diesel locomotive jack to its present line of railroad jacks. This new air operated diesel jack, Model No. 35-HL, is the result of three years engineering and testing at the Joyce-Cridland Plant, Model No. 35-HL jack completely fills the need for a portable piece of lifting equipment required to make complete truck and traction motor changes and center plate inspections. The new Joyce jack weighs only $\frac{1}{5}$ as much as the existing jacks with the same lifting capacity. It can be moved and operated easily by one man. All weight reduction of the jack has been accomplished by using aluminum alloys throughout the frame work. Internal working mechanism and gearing is constructed of high alloy steel precision machine parts. All motor parts and intermediate gears are interchangeable with standard Joyce, air operated, jacks. Total weight of the new unit is 1255 lbs. It has a 35 ton lifting capacity with a 4 foot, $4\frac{1}{2}$ inch rise. It can be used in lifting engines, freight cars, passenger cars and diners. For additional information write DIESEL PROGRESS, File 102, P.O. Box 8458, Cole Station, Los Angeles 46, Calif.

AIR-MAZING FACTS

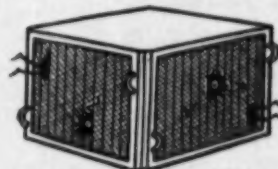
BY O. S. GLOW



METEORIC DUST ROUGHS UP ROCKET!
A V-2 rocket leaves the earth with a smooth, shiny surface — returns with its skin pitted and scarred. The reason: while zooming through the stratosphere, the rocket is bombarded by thousands of tiny dust particles torn loose from meteors.



AIR SCRUBBED CLEAN IN BATHTUB OF OIL!
Air-Maze oil-bath air filters literally "scrub" dirt out of engine intake air in a pool of oil. Result: less engine wear from abrasive dust and grit.



DOGHOUSE FOR DUST! Air-Maze DH ("dog house") filter assemblies on intake pipes protect engines against sucking in dust and dirt. All-metal construction. Filter cells can be removed quickly for servicing. Available for indoor or outdoor applications.

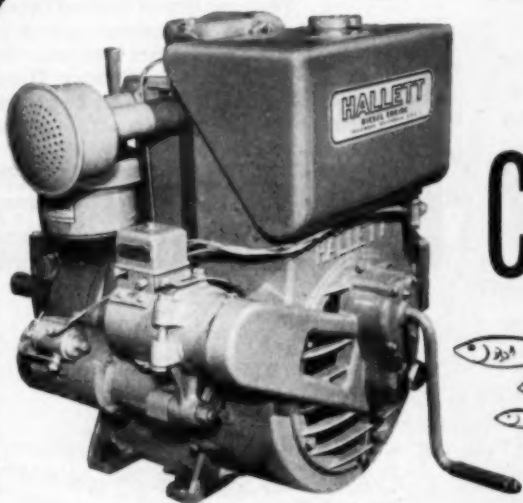
WHETHER YOU BUILD OR USE engines, compressors, air-conditioning and ventilating equipment, or any device using air or liquids — the chances are there is an Air-Maze filter engineered to serve you better. Representatives in all principal cities, or write Air-Maze Corporation, Cleveland 28, Ohio.

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The Filter Engineers

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SPARK ARRESTERS

LIQUID FILTERS
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GREASE FILTERS



compact



Hallett Diesels are the most compact power plants—only 24" high, $14\frac{1}{2}$ " long, 18" extreme length over muffler, and extreme length over crank and power take off shafts $26\frac{5}{8}$ "—5 full shaft BHP with continuous operation—7 shaft BHP for intermittent operation.

Other Hallett Diesels to 18 HP. Write today and find out why compact Hallett Diesels will do a better job for you.



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World's Largest Manufacturer of Low Horsepower Diesel Engines.
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GM 71 567 268

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Don't throw away your worn injector plungers and bushings. HANCOCK reconditioning of plungers and bushings is now available BY MAIL.

GM 71, price \$5.50 each—F.O.B. Findlay, Ohio. (A worn unit must be forwarded to us for each reclaimed unit ordered.)

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Write for Price List on Reclaimed GMC Injector Tips, Crown Check Valves and Check Valve Seats.

HANCOCK reconditioned unit injectors for GM 71 engines are available in 60mm, 70mm, 80mm and 90mm by mail. (Worn unit must be forwarded for each reconditioned unit ordered.)

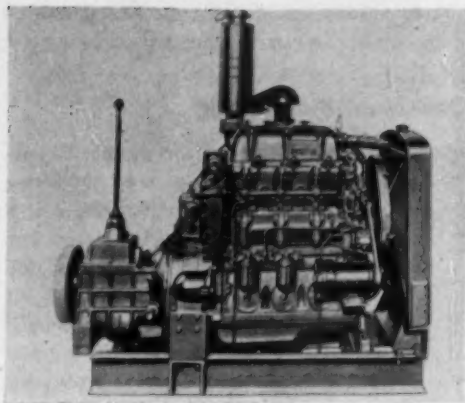
HANCOCK Services give you a flat price for an injector exchange. Completely rebuilt thoroughly tested units. An unconditional guarantee of satisfaction.

HANCOCK is now an Authorized American Bosch service shop—let us know of your requirements.

Order or write today. Dealerships available.
HANCOCK DIESEL SERVICE CO.
300 Walnut Street Findlay, Ohio



Offers New "Diesel Power-Package"



A new service to operators of shovels has been announced by Harnischfeger Corporation, Diesel Engine Division, Crystal Lake, Illinois. This is the "P&H Diesel Power-Package," a complete power unit that's engineered for simple installation in any make shovel. The replacement package is built around P&H's model 387-C, 2-cycle, 3-cylinder diesel engine of 60 horsepower. Included in the power package is all equipment required for shovel installation: mounting brackets to fit original engine bed, necessary controls and power connections and reduction gear, if needed.

Tests by Harnischfeger, with this replacement diesel, show very substantial savings in operating costs. The P&H Diesel Power-Package pays for itself, it is claimed, in operating economy, in as little as 15 months of service. Simplified maintenance and greater accessibility are important features of the shovel engine. Illustrating these, P&H points to its patented cylinder head and liner assembly which can be replaced as a unit in less than one hour.

Replacement can be made in the field without the necessity of dropping the oil pan. Literature describing the "P&H Diesel Power-Package" is available by writing Harnischfeger Corporation, Diesel Engine Division, Crystal Lake, Illinois.

Expands Plant Facilities

A contract has been let for the construction of an additional building on its Camp Reynolds eight acre site near Greenville, Pa., according to an announcement from Diesel Power, Inc. of Pittsburgh, Pa. The new structure will be 25 ft. 6 in. by 60 feet, of concrete block with concrete floor. The building will be used for assembling and testing the company's improved type of diesel engines and will include, among other equipment, a modern wind tunnel. This will be the second structure added to facilitate the production of diesels since the company's purchase of the Industrial Machine Company last July.

Over 85% of the torque wrenches used in industry are

Sturtevant TORQUE WRENCHES

Read by Sight, Sound or Feel.

- Permanently Accurate
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- Faster—Easier to use
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in inch ounces... inch pounds... footpounds
(All Sizes from 0-6000 ft. lbs.)

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PA STURTEVANT CO.

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We have lists of trained Diesel, Tractor, and Heavy Equipment operators, service men, and mechanics available for employment throughout the country. If you have need of such a man we will be glad to furnish complete information without obligation to you. Write to

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NEW PETROMETER

FOR ALL TANKS
FOR ALL LIQUIDS
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Insist on VELLUMOID for Quality
GASKETS AND SHEET PACKING
FOR OIL, WATER AND GASOLINE



NOW EVEN BETTER

Inland River Reports

By DAVID I. DAY

AT THE Alexander Shipyards, New Orleans, are being built four neat tugs of around 600 hp. each, all using twin Atlas Imperial engines. The boats are for Arthur Duvic's Sons, New Orleans, well-known in the diesel engine sales and service fields and handling also a full line of marine supplies—especially pumps. Names for the boats have not been selected.

A GREAT favorite on the lower Mississippi and the Gulf country over to Pensacola, Fla., is the tug *Nellie*, now 74 years old and working with regularity and efficiency for her owners, the Edmundson Towing Co. She has an iron hull and is powered with a 400 hp. Cooper-Bessemer diesel unit. Of course, years ago the tug was steam powered. Joe Matlock, New Orleans, reports: "The old sister was anchored at Baton Rouge last night. Looks fine."

WE NOTED recently the *Central* of the Mississippi Valley Barge Line on her first trip to the upper Ohio River. She was pushing a mixed tow, largely of fluorspar and scrap metal. This Calumet-built vessel is an impressive looker, 140 feet long, Enterprise-engined, 3000 hp., and one of the nice fast workers in rough water or otherwise.

WE MIGHT add that from three letters we learn the champion coal towboat of the upper Mississippi is now working on the upper Ohio. She is the

A. M. Thompson, another MVBL beauty, with twin Enterprise engines and Kort nozzles, rated at about 2600 hp.

ONE OF THE most popular of the 1952 crop of boats is the fast and powerful *Chippewa* of the Genesee Transportation Co., home office, Waukesha, Wis. The boat was built by Nashville Bridge with twin General Motors diesel engines. This winter she has a regular run in the oil trade from the oil port, Houston Texas, to Follansbee, West Va.

WE HAVE observed many times neat towing on the part of the little towboat *Castle* of the U. S. Engineers, Huntington, West Va. Last note showed her pushing with gate wheels and axles for the locks. Not long since she was handling a big barge of coal. The boat is about five years old and is powered by Gray 6-cylinder diesels, total 330 hp.

WE HAD A recent inquiry as to the *Claude Tully* of the Patton-Tully firm in Memphis. We learn she is pushing oil between Port Arthur, Texas, and Ostrica, La. She is doing wonderful work and has since she came out in 1950. Her engine room is very excellent, using Fairbanks-Morse units, about 3200 hp. in all.

THE NEWEST boat we saw during the holidays, is the *Jolly Roger* of the W & N Towboat Co., Harvey, La. She was built by the Vicksburg Marine Ways, Vicksburg, Miss., and uses twin Caterpillars totaling 1000 hp. A very fine looking pusher.

IN 1951, the Freeport Sulphur Company, at Port Sulphur, La., had the Arnold V. Walker Shipyard,

Pascagoula, Miss., build the *E. C. Marshall*—a neat 800 hp. towboat, using twin Caterpillars. It proved a very excellent investment. Coming off the ways at the same yards now are the three neatest little boats to be seen in Louisiana territory. They are the *H. A. Purgley*, the *V. J. Vallot*, and the *R. I. Brubaker*—all 80 x 22 x 8, all Caterpillar-engined. The *Purgley* and *Vallot* are already at work.

WHILE ON the Mississippi run in December we had the good luck to see the *Delta Cities*, flagship of the great Lake Tanker river fleet headed down stream on her final upper Mississippi River trip of the season. The locks are being closed to boats and everything is ready for the long reign of ice. The *Delta Cities* made a remarkable towing record this summer. She is a 3200-hp. pusher built in 1951 and powered by two Fairbanks-Morse diesel engines.

THE LAST picture we took of the river's activity of the journey was of the sturdy *Ferdinand* of the Bull Towing Co., Joliet, Ill. She was going up with a dredge and attendant plant for a point near New Boston, Ill. The *Ferdie* is another constantly moving advertisement of Caterpillar—the single engine on the boat being one of the smoothest running on the rivers.

THE Superior Oil Company, Houston, is very much pleased with their new off-shore drilling barge with which oil wells in the Gulf of Mexico can be drilled 25,000 feet if needed. The big barge is powered with Superior diesel engines, 5000 hp., with all auxiliaries also Superior. The job was completed at Livingston Yards, Orange, Texas.

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ROTARY PUMPS

NOT A SIDE-LINE

The designing, testing, manufacturing and applying of Viking Rotary pumps is VIKING'S one and only job.

What does this actually mean to you? It means that the energy, the development, and the output are at no time devoted to some other product. The result is a superior rotary pump in a greater range of sizes and types to really fit *your* needs better.

Investigate the *complete* Rotary Pump line—VIKING. Start with bulletin 53SN.

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Left: 2200 Class Mechanical Governor
Right: 3200 Class Hydraulic Governor

GOVERNORS by PICKERING

For 90 years the name Pickering has been associated with fine governors. The full line covers all requirements of diesel, dual fuel, steam and gas engine as well as turbine speed regulation.

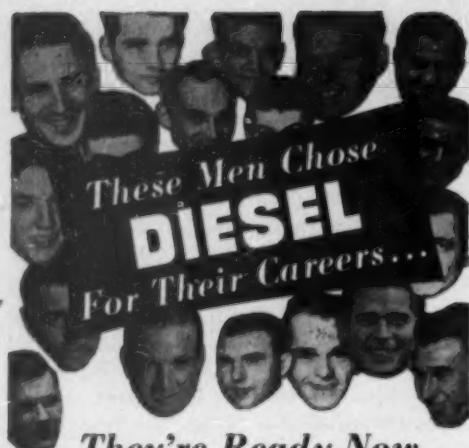
ALL MODELS AVAILABLE IN EITHER CONSTANT SPEED OR VARIABLE SPEED TYPES.

To secure complete research and design engineering co-operation on governor problems, write

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Have you a place for Diesel-trained men? UEI graduates are at your service! These men are energetic, willing workers. They look to DIESEL for their futures. They have good basic training in operation, maintenance and repair of all types of Diesel engines. The Diesel man you want is ready to go to work for you in any part of the United States or Canada, or will travel farther if the opportunity is right. Tell us your needs. We have the man for you!

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EMD Appointments



William D. Davis

John C. Sikes

The appointment of William D. Davis to the newly created position of branch manager of the Robertson, Missouri Factory Branch of Electro-Motive Division of General Motors is announced by Mr. N. C. Dezendorf, vice president and general manager of Electro-Motive Division in La Grange, Illinois. Because of the growth of the parts and rebuild activities in this branch, and to prepare for further expansion, the position of branch manager, reporting to the general manager at La Grange, has been created. Mr. John C. Sikes will succeed Mr. Davis as branch plant superintendent.

Mr. Davis was born in Topeka, Kansas in 1911. He was graduated from Kansas State College, after which he took special diesel training at General Motors Institute at Flint, Michigan. He worked at Cleveland Diesel Engine Division at Cleveland from 1933 to 1935 when he was transferred to Electro-Motive as chief clerk in the Service Department. Since joining Electro-Motive he has served as service office engineer, assistant service manager, parts manager, service repair manager, and most recently as branch plant superintendent of the Robertson Branch before his appointment as branch manager.

Mr. Sikes, a native of Taylorville, Illinois, was born in 1917. Following his release from the United States Army he joined Electro-Motive Division in May, 1945 as an electrical inspector. In 1949 he served as inspector of machine parts and in 1950 he became resident inspector of the Robertson Factory Branch. He has served as foreman of inspection at the Factory Branch until his appointment to the position of branch plant superintendent.

Moves Atlanta Offices and Warehouse

White Machine Works, manufacturers of Superior-Arrowhead replacement engine parts for gasoline and diesel engines, have announced the moving of their Atlanta warehouse and office to 1362 Spring St., N.W. They were formerly located at 734 West Peachtree St. This new warehouse will serve parts wholesalers of the southeastern states. Mr. Tom C. Brown is district manager of the Atlanta office and has Mr. J. D. Griffin working with him as sales manager.

Three-Man Sawmill



It takes only three men to operate the modern sawmill of the Owens Brothers Lumber Company at Payson, Arizona. The mill, owned and operated by Keith Owens, includes both saw and planer and produces 25,000 board feet of pine lumber in an eight-hour day. An air-operated carriage controlled by the sawyer, makes it unnecessary to have a "ratchet-setter" ride the carriage. This explains the simple three-man operation. Power for the entire mill is furnished by four- and six-cylinder General Motors diesel engines and a GM diesel generator set. The four-cylinder GM operates the planer while the six-cylinder engine operates a 72 in. bandsaw. The generator set furnishes electric power to operate the sawmill accessories, which include an edger, log washing pump, air-compressor and conveyors.

Mr. Owens supervises all operations at his mill including logging and trucking. At present he is in the midst of an experimental project for the Forest Service to determine if dead timber in burnt-over and storm-stricken areas nearby can be salvaged satisfactorily for use as cross ties and box material. The diesel engines and generator set used in the mill were furnished by O'Connell Brothers, Detroit Diesel Engine Division Distributors at Phoenix.



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GRINDING
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- ★ Hard Chromium Plating Service
- ★ Crankshaft Straightening Service
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Four machines giving range from the smallest up to crankshafts with stroke of 16" and 200" O.A.L. Complete grinding service for locomotive, stationary, marine, automotive and compressor crankshafts. Undersized journals restored to size by hard chromium plating.

Established 1924 . . . 28 years
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THE LARGEST CRANKSHAFT GRINDING MACHINE IN
THE WORLD USED IN AN INDEPENDENT REPAIR SHOP

NATIONAL WELDING & GRINDING CO. 2929 CANTON ST.
DALLAS 1, TEXAS

West Coast Diesel News

By FRED M. BURT

SOLD By Shepherd Tractor & Equip. Co., Los Angeles, a 120-hp. Caterpillar diesel engine to W. A. Droe to power a Smith deep well turbine pump for irrigation of cotton and grain fields at Coburca, Sonora, Mexico.

THE NEW 127 ft. steel tuna clipper *Sea-Preme* built by National Steel & Shipbuilding Co. for Westgate-Sun Harbor Co. (both of San Diego) has an 800-hp. supercharged Enterprise propulsion diesel; auxiliaries are two 200-hp. Murphy diesels direct-connected to 12 7 kw. generators.

SUPPLIED BY Engineering Controls, Inc., Los Angeles, a Vapor Phase unit for mounting on a D8 diesel tractor to provide for adequate diesel engine cooling under all conditions of operation of saw driven for cutting down large trees in land clearing, by Fabick Bros. Co., Salem, Ill.

PURCHASED BY the Santa Monica Municipal Bus lines four new White buses powered with 200-hp. Cummins diesel engines.

RECENTLY INSTALLED in the San Diego-Coronado ferry *North Island*, two 440-hp. Cooper-Bessemer diesels replacing an old German diesel engine.

DALE E. WATTS, owner of Point Loma Anchorage, San Diego (commercial fishing boat moorage) has been appointed distributor in the San Diego area for Kermath engines; also, in association with Fellows & Stewart, Terminal Island, will appoint a dealership at Newport Beach for complete Kermath service along the Southern California coast.

PURCHASED BY the Inyo County Road Dept., a 6-cyl. 250-hp. Caterpillar diesel to power a Snogo (rotary snow plow), replacing a gasoline engine.

FOR AUXILIARY power uses at International Airport, Los Angeles, North American Aviation, Inc. has installed an electric generating plant; a 275-hp. supercharged Cummins diesel driving an Electric Machinery 125-kw. generator.

RECENTLY INSTALLED by Union Oil Co. in their Fullerton, Calif. field, two 330-hp. natural gas engine driven Cooper-Bessemer compressors.

TO OPERATE an ice machine on his troller *Hike II* Eric John, San Diego has installed a 5-hp., air-cooled Hallett diesel on the deck.

NEARLY complete is the new Union Pacific diesel shop, in the yards in East Los Angeles, which will nearly double the major diesel engine overhaul and trip servicing facilities.

FOR POWER on a Morrison-Knudsen construction job on a river dam project at Navajoa, Sonora, Mexico, a 12-cyl. 500-hp. Caterpillar diesel engine driving a 300-kw. GE generator.

FOR OIL field operations of Southwest Exploration Co., of Huntington Beach, Calif., a 440-hp. Cooper-Bessemer, natural gas engine driven compressor.

INSTALLED AT each of three Shell Oil Co. oil well pumping stations, Ventura, Calif. field, 10 6-cyl. 50-hp. Minneapolis-Moline natural gas engines; waste heat (1500 lbs. steam per hour) from each set reclaimed by a single Vapor Phase unit (replacing all radiators and fans) is used to supply heat for the Kobe oil pumping system.

FOR General Petroleum drilling operations in Southern California, a trailer-mounted V-12, 400-hp. Cummins diesel (from Cummins Sales & Service, Los Angeles) with Allison torque converter, to power mud pumps at different successive locations.

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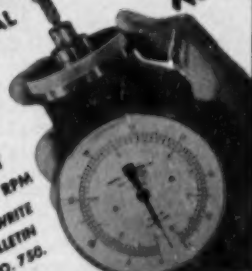



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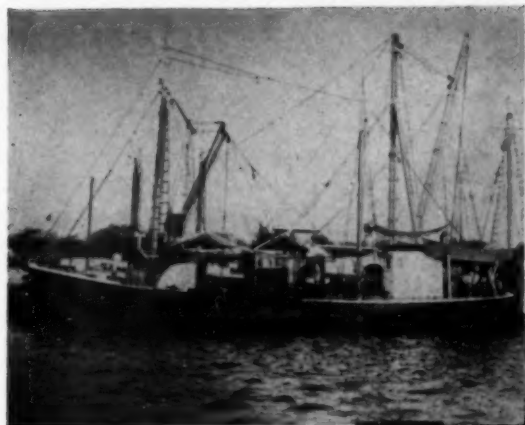


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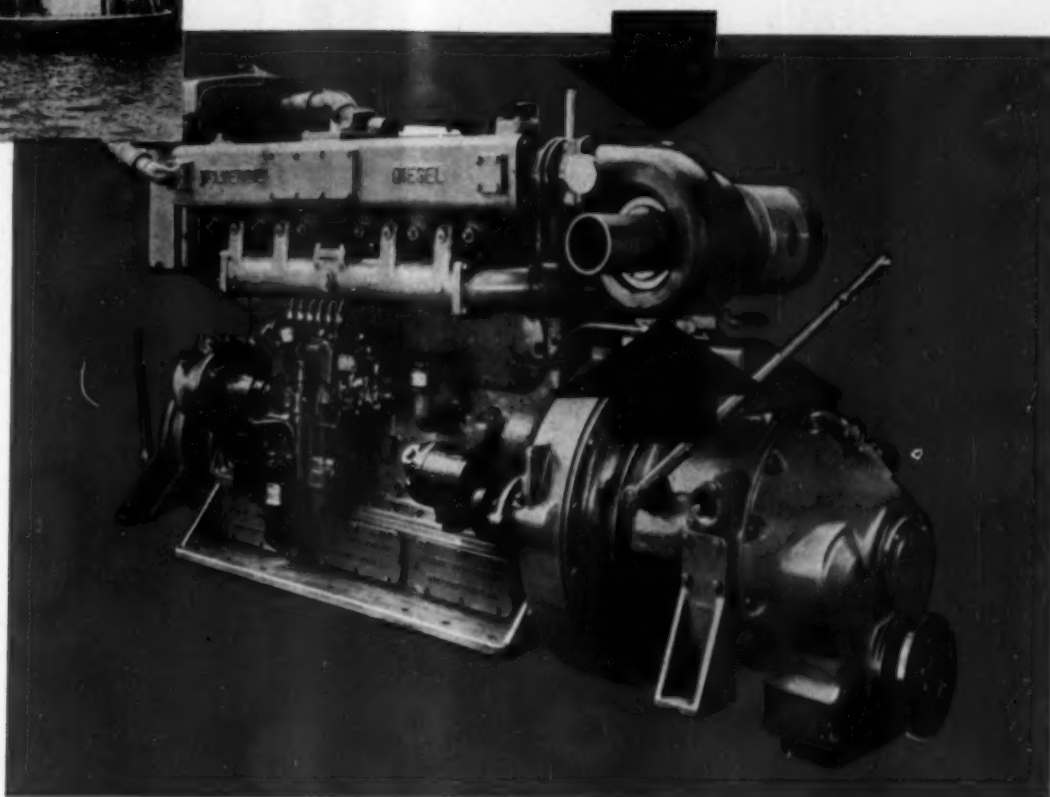
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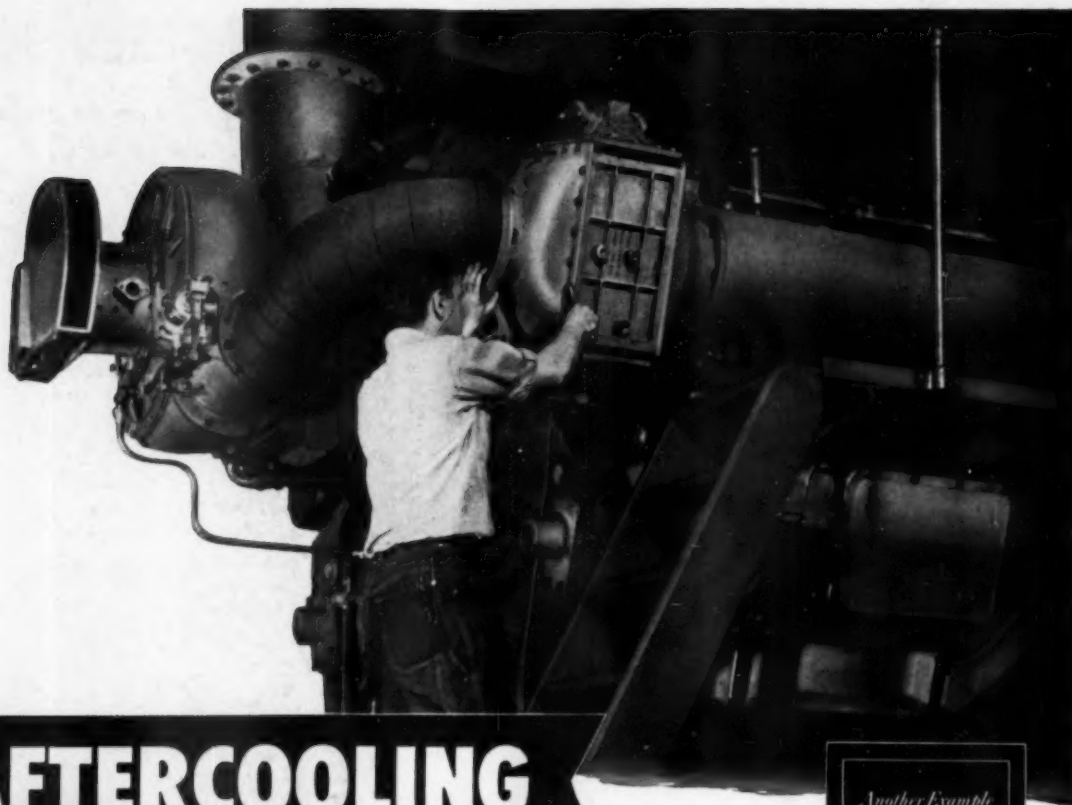
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